M/037/0088
TASK 3278
CC: Tom
Wayne

0015

LISBON VALLEY MINING CO

Mr. Paul Baker
Utah Division of Oil, Gas, & Mining
1594 West North Temple Suite 1210
Salt Lake City, UT 84114-5801

December 1, 2009

Re: Response to Comments Proposed Mine Plan Amendment. Sentinel East Backfilling. Lisbon Valley Mining Company LLC. 920 South County Road 313, La Sal, Utah, 84530.

Dear Paul:

The Lisbon Valley Mining Co LLC (LVMC) respectfully responds to DOGM's comments regarding the above-referenced amendment. Our response is submitted as an appendix to the mine plan and includes BLM final bond determination and backfilling approval.

Please call Lantz Indergard at (435) 686 9950 #106 or email Lindergard@lisbonmine.com if additional information is needed.

Sincerely,

Lantz Indergard PG
Environmental Manager
Lisbon Valley Mining Co LLC

RECEIVED
DEC 03 2009
DIV. OF OIL, GAS & MINING

0015

Form MR-REV-att (DOGM – Revise/Amend Change Form)
(Revised September 14, 2005)

Application for Mineral Mine Plan Revision or Amendment

Operator: LISBON VALLEY MINING CO LLC

Mine Name: LISBON VALLEY MINE **File Number: M/** 037 1088

Provide a detailed listing of all changes to the mining and reclamation plan that will be required as a result of this change. Individually list all maps and drawings that are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise or amend the existing Mining and Reclamation Plan. **Include page, section and drawing numbers as part of the description.**

DETAILED SCHEDULE OF CHANGES TO THE MINING AND RECLAMATION PLAN

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☑ ADD	☐ REPLACE	☐ REMOVE	APPENDIX A
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments and obligations, herein.

LANTZ INDERGARD
Print Name

[signature] ENG. MANAGER
Sign Name, Position

12-1-09
Date

Return to:

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801
Phone: (801) 538-5291 Fax: (801) 359-3940

FOR DOGM USE ONLY:
File #: M/ /
Approved:
Bond Adjustment: from ($)
to $

O:\FORMS\MR-REV-att.doc

LISBON VALLEY MINING CO

Mr. Lynn Jackson
US Bureau of Land Management
82 East Dogwood
Moab Utah 84532

April 24, 2009

Mr. Paul Baker
Utah Division of Oil, Gas, & Mining
1594 West North Temple Suite 1210
Salt Lake City, UT 84114-5801

Re: Proposed Mine Plan Amendment. Sentinel East Backfilling. Lisbon Valley Mining Company LLC. 920 South County Road 313, La Sal, Utah, 84530.

Dear Lynn and Paul:

The Lisbon Valley Mining Co LLC (LVMC) is pleased to submit this proposal to authorize expansion of Dump C and backfilling the Sentinel East pit (Sentinel East) at the Lisbon Valley Mine. Backfilling the pit will result in nominal changes to the Plan of Operations (POO) and Notice of Intent (NOI). Dump C will be expanded approximately 45 acres and Waste Dump A will be reduced about 48 acres. The net reduction in disturbance reflects emplacement of waste rock below grade.

Our proposal is submitted in accordance with 43CFR 3809.401-420 and Utah Administrative Code (UAC) Title R647-1-104-110. It is formatted as a single document for simultaneous processing by the US Bureau of Land Management (BLM) and Utah Division of Oil, Gas and Mining (DOGM).

LVMC is anticipating positive effects of this amendment, both from an environmental and economic standpoint. Figure 1 is embedded to show the as-built topography of the Sentinel Pits relative to Dump C.

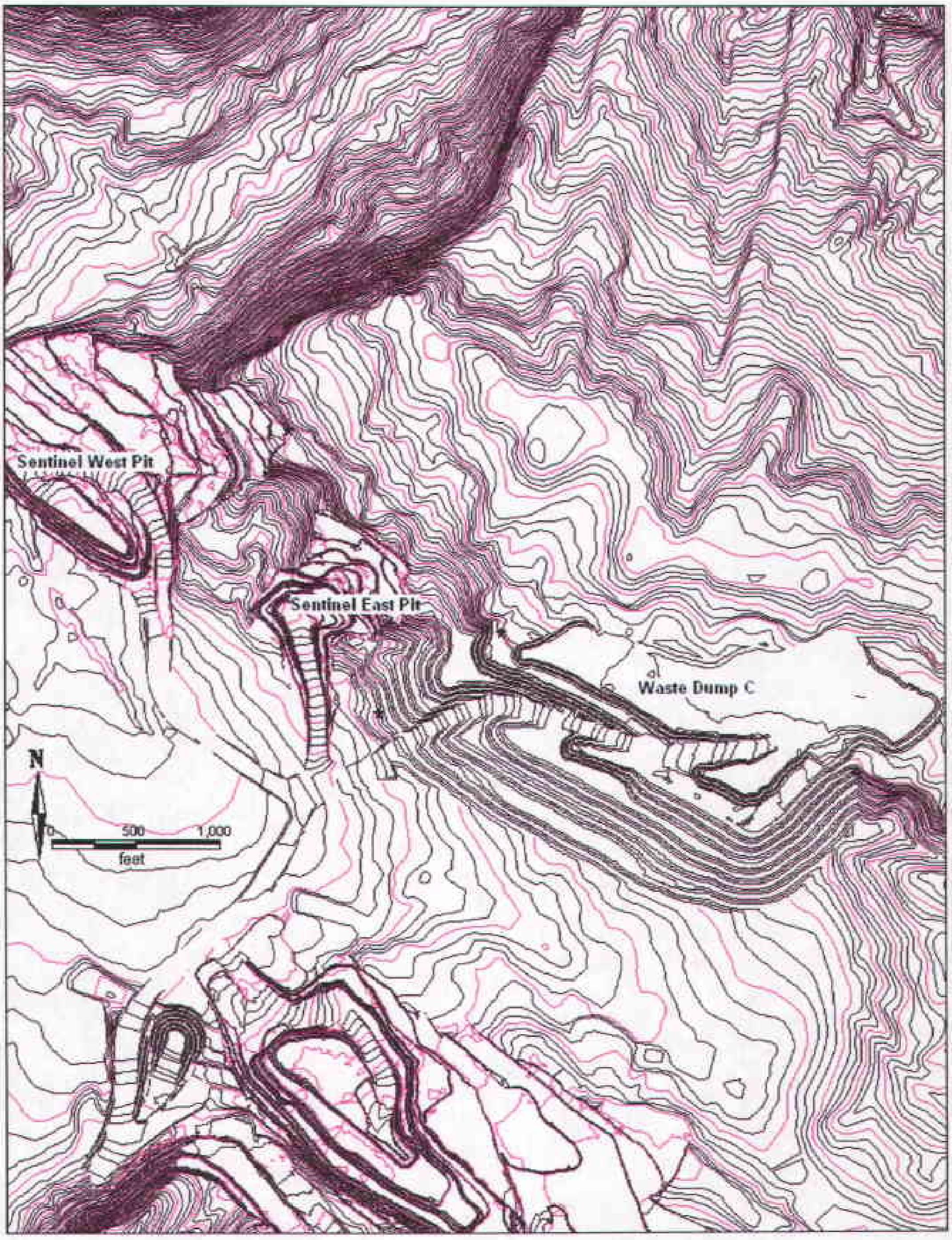


Figure 1
As-Built Topography Sentinel Pits Area and Waste Dump C January 2008

Our proposal has the following objectives.

- Provide a technical description of the proposed amendment relative to the approved POO and Record of Decision (ROD).[1,2]
- Summarize the cumulative consequences relative to environmental baselines documented the Final Environmental Impact Statement (FEIS).[3]
- Authorize a bond release for concurrent reclamation of Dump C and utilize this as a tradeoff for the expansion.

The proposal is divided into three sections. Sections 1 and 2 provide information for analysis in accordance with the National Environmental Protection Act (NEPA). Section 3 reflects the proposal in accordance with forms required by DOGM.

Each section includes the following information.

1. Section 1 describes the scope of our proposal in technical terms. This includes a technical description, conceptual dump design, pit geology maps, summary table of cumulative effects, and revised site plan. Te dump was designed using mine planning software (VULCAN 6™) and is depicted in plan view and section view as a series of images. Pit geology maps are included to show the net acid neutralization potential of Sentinel East and Centennial Pit, the planned source of waste. The summary table (Table 1) describes the cumulative effects of the proposal relative to mining volumes, ground disturbance, and reclamation bonding (3809.401 & R647-4-105). The site plan depicts expansion of Dump C and reduction of Dump A.

2. Section 2 describes the consequences of the proposed amendment relative to the environmental baselines evaluated in the FEIS

3. Section 3 describes the scope of our proposal in accordance with forms required by DOGM. The include forms MR-Rev and MR-Site/Bond Release.

---

[1] Summo USA Corp 1995. Proposed Plan of Operations – Lisbon Valley Project, prepared for US Department of Interior, Bureau of Land Management, Moab District, Grand Resource Area. 8 August, 1995

[2] BLM 1997. Record of Decision Environmental Impact Statement Lisbon Valley Copper Project. 26 March, 1997

[3] BLM 1997. Final Environmental Impact Statement, Lisbon Valley Copper Project, February 1997.

Section 1 – Technical Description

Sentinel East is located north of the Burro canyon (BC) aquifer. The bottom of the pit is 6320 feet above mean sea level (amsl). This is approximately 70 feet above the Burro Canton (BC) aquifer.[4] Backfilling the pit will expand Dump C approximately 45 acres (9,000 kt volume) and reduce Waste Dump A by approximately 48 acres (9,000 kt volume). The cumulative effects result in a net reduction of mine disturbance.

LVMC is confident backfilling the pit is both a technically sound and environmentally sound alternative for the following reasons:

- The bottom of the pit is 70 feet above groundwater.
- The bottom of the pit is comprised of Lower Dakota Sandstone (Rock Type 6) and Burro Canyon Formation (Rock Type 7). Both of these rock types have a net acid-neutralization potential (ANP).
- Waste rock hauled to the pit will be managed in accordance with the Waste Rock Monitoring Plan.[5] This means all waste with acid generation potential (AGP) will be encapsulated in waste with acid neutralizing potential (ANP).
- ANP Beds 11-15 (Rock Types 6-7) dominate the east side of the Centennial Pit, where mining will resume. This ensures that the volume of ANP waste is will be greater than the AGP waste.

In summary, pit backfilling results in reduced ground disturbance, much improved view shed, improved safety, and reduced geotechnical hazards. There are no subsurface impacts, including changes to groundwater quality, either on state or federal land (R647-4-109).

Attachment #1 includes a table and series of figures. Table 1 documents the cumulative effects to the mine plan. Figures include Redesigned Waste Dumps (pdf), VULCAN pit design in section and plan view (Power Point file), Sentinel East geology map (pdf), Centennial Pit cross section (pdf), LVMC Rock Type designation table (pdf) and revised site plan (pdf).

---

[4] Whetstone & Associates 2007. Annual Hydrogeologic Evaluation Update 29 January 2007

[5] LVMC 2007. Waste Rock Sampling Plan Rev. 1 20 Dec 2007

Section 2 - Environmental Consequences

The environmental consequences of backfilling Sentinel East Pit are outlined in Table 2. The evaluation includes the same baselines evaluated in the FEIS:

- Vegetation
- Wildlife
- Soils
- Hydrology
- Cultural
- Geotechnical
- Air and Meteorological
- Socioeconomics
- Transportation

Table 2 is included as Attachment #2.

Section 3 – Required Forms

MR-REV

Form MR-REV is attached as Attachment #3 (pdf). This form includes two replacement pages for the 1995 Plan. No replacement pages were necessary for the NOI.

MR-Site/Bond Release

The bond release request solicits a surety exchange for expansion of Dump C using concurrent reclamation. This form is included in Attachment #3 (pdf) along with a series of figures showing what is permitted, what is bonded, and extent of concurrent reclamation relative to the proposed expansion.

The bond release has greater value than the planned expansion of Dump C. For this reason, LVMC is requesting and surety trade.

Approval Request

The LVMC appreciates the agencies' ongoing guidance and support as the LVMC continues the planned mine expansion. We look forward to your review, approval, and written request to proceed. Please call Lantz Indergard at (435) 686 9950 #226 or email Lindergard@lisbonvalley.com if additional information is needed.

Sincerely,

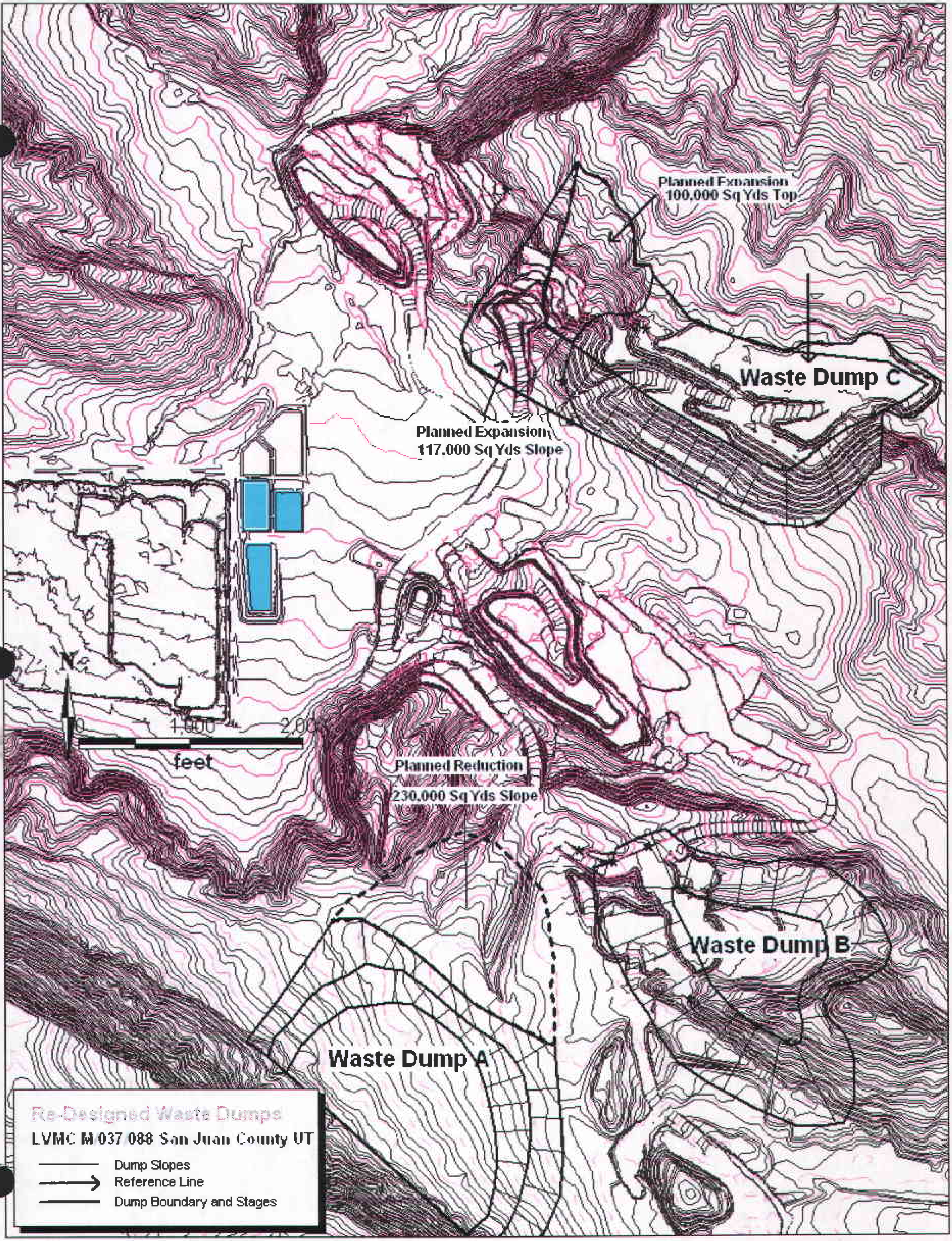
Lantz Indergard PG
Environmental Manager
Lisbon Valley Mining Co LLC

Attachment 1

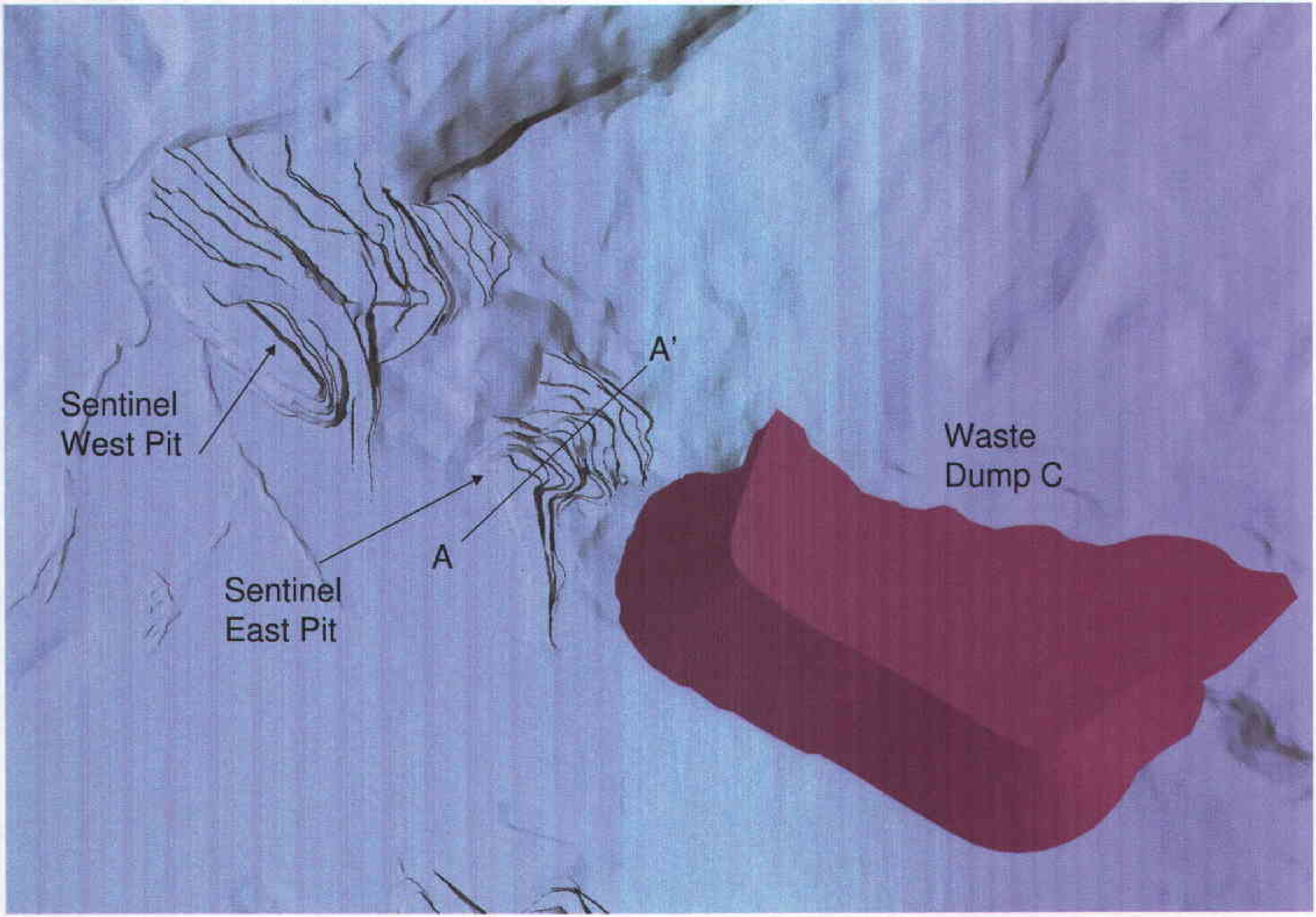
LISBON VALLEY MINING CO

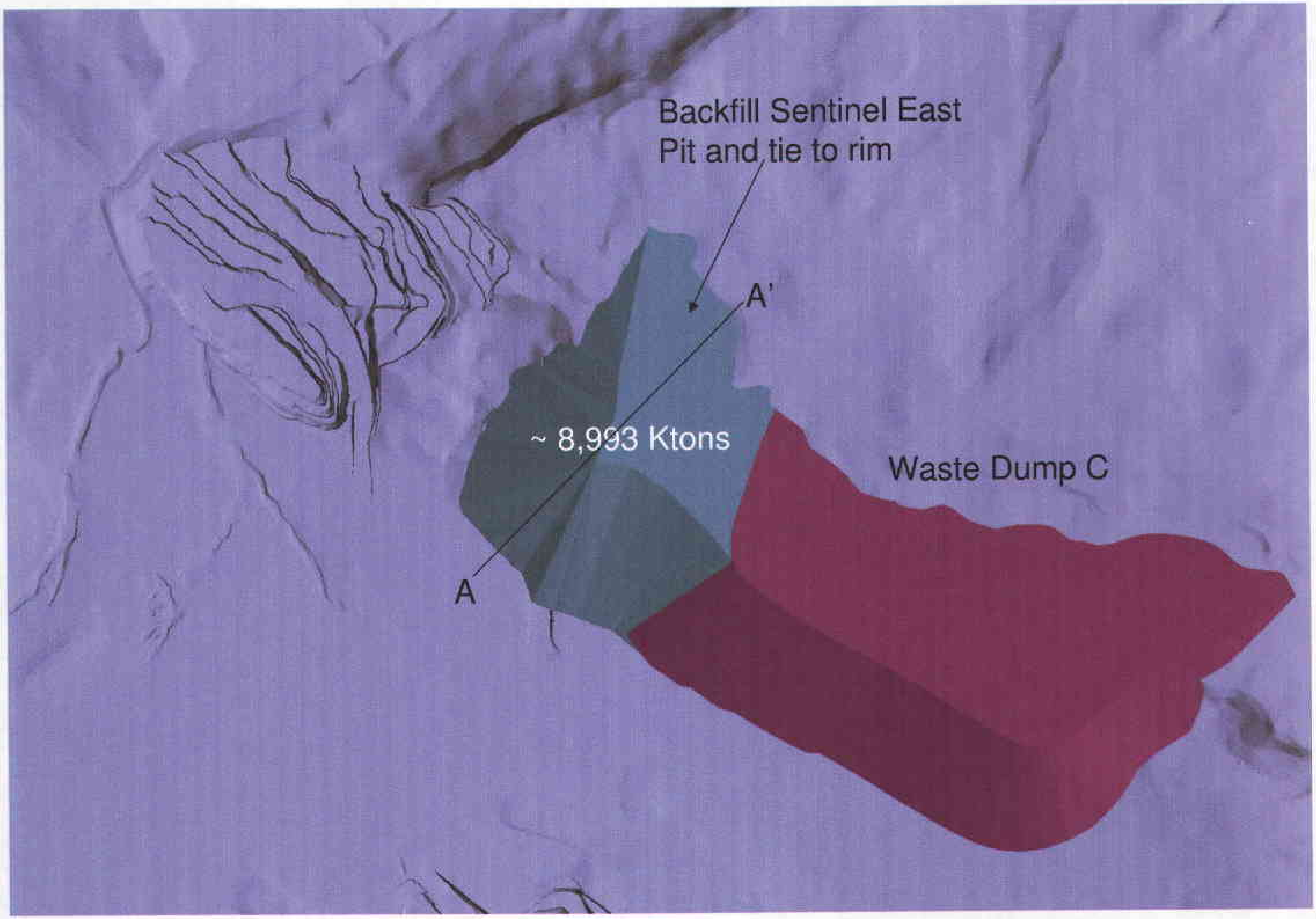
Table 1
Cumulative Adjustment to
Mine Plan
Lisbon Valley Mining Co LLC
San Juan County, Utah

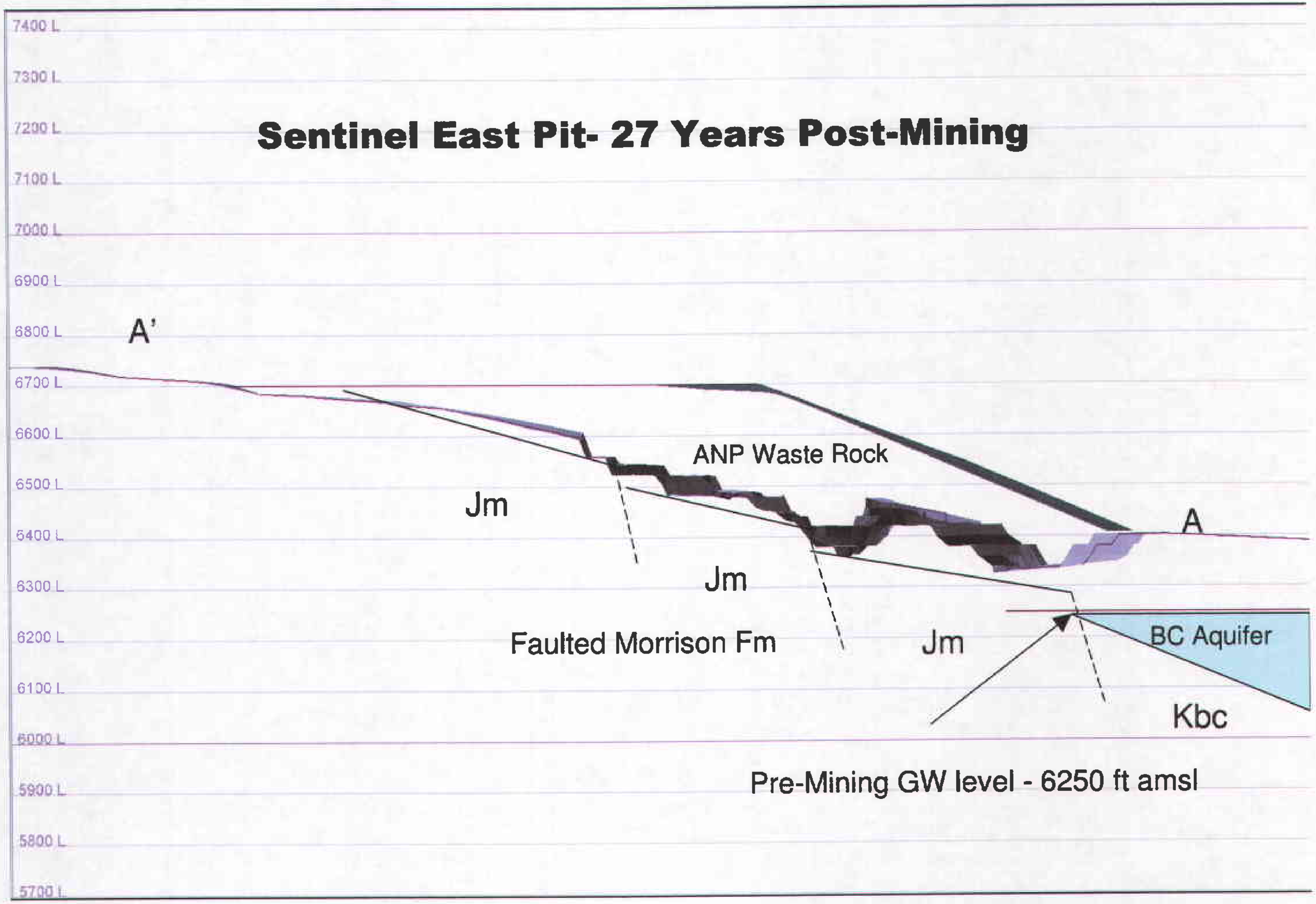
	Mining Volumes (cu yds)		Disturbance (acres)				Reclamation and Bonding	
	Ore	Waste	Pits	Dumps	Leach Pad	Total Mine	Mining Through Stage III Heap	Total Mine
2007 Amended Plan Centennial Expansion Stage IV Heap Leach ILS Pond	28,796,643	64,882,143	255	376	266	1109	$6,076,888	$9,801,000
Proposed Amendment Backfill Sentinel East Pit	28,796,643	64,882,143	255	373	266	1106	$6,076,888	$9,801,000
Adjustment	0.0%	0.0%	0%	-0.8%	0.0%	-0.30%	0.0%	0.0%



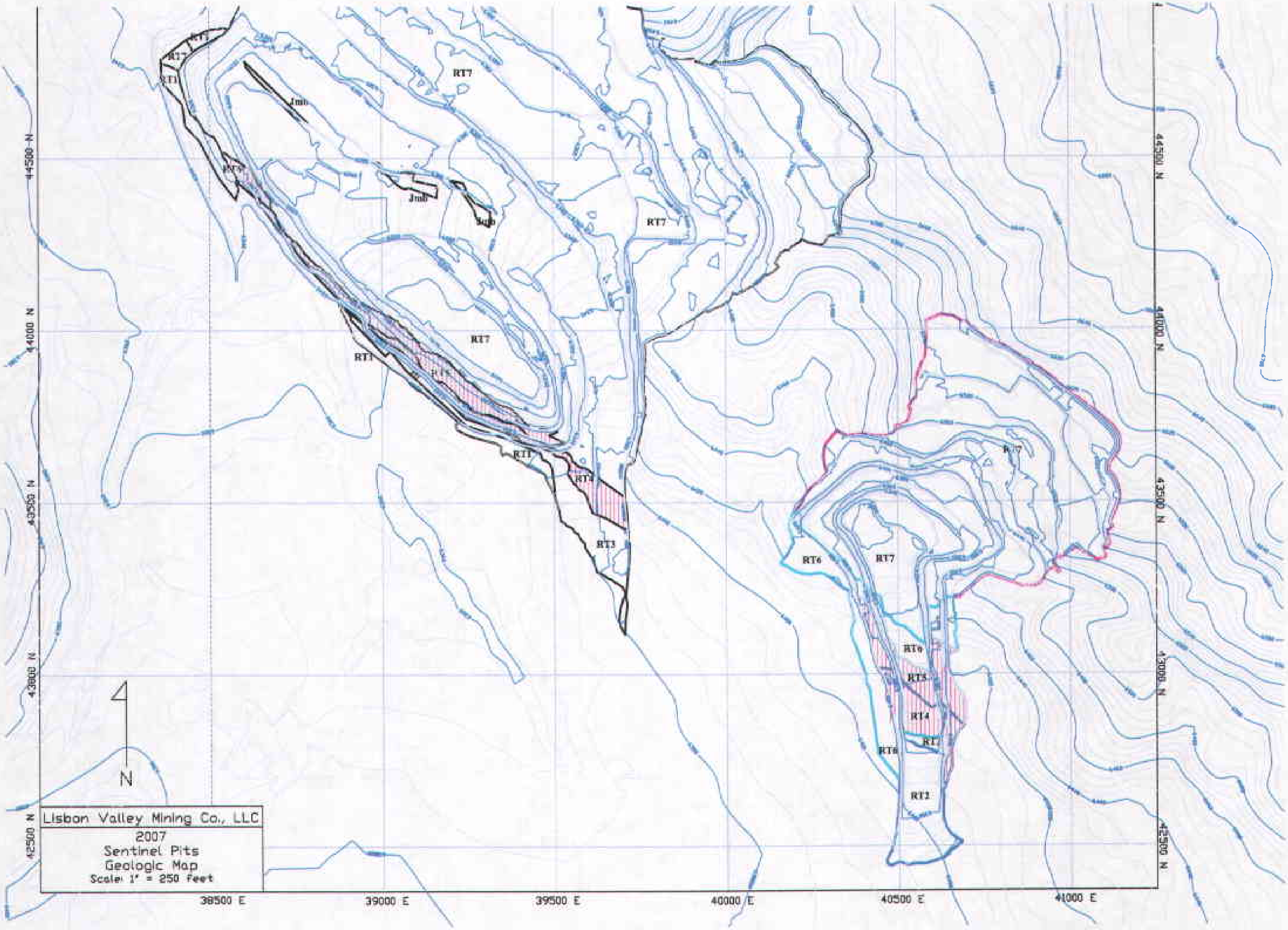
Planned Expansion
100,000 Sq Yds Top
Waste Dump C
Planned Expansion
117,000 Sq Yds Slope
N
0
1,000
2,000
feet
Planned Reduction
230,000 Sq Yds Slope
Waste Dump B
Waste Dump A
Re-Designed Waste Dumps
LVMC M 037 088 San Juan County UT
Dump Slopes
Reference Line
Dump Boundary and Stages


A'
Sentinel
West Pit
Waste
Dump C
A
Sentinel
East Pit

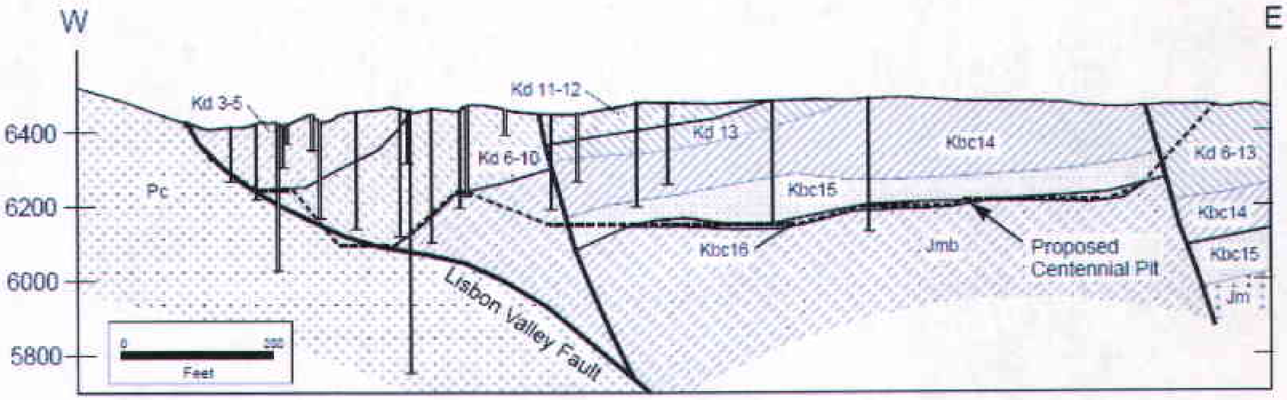

Backfill Sentinel East
Pit and tie to rim
A'
~ 8,993 Ktons
Waste Dump C
A



Sentinel East Pit- 27 Years Post-Mining
7400 L
7300 L
7200 L
7100 L
7000 L
6900 L
6800 L
6700 L
6600 L
6500 L
6400 L
6300 L
6200 L
6100 L
6000 L
5900 L
5800 L
5700 L
A'
A
ANP Waste Rock
Jm
Jm
Jm
Faulted Morrison Fm
BC Aquifer
Kbc
Pre-Mining GW level - 6250 ft amsl



Lisbon Valley Mining Co., LLC
2007
Sentinel Pits
Geologic Map
Scale: 1" = 250 feet
N
RT7
Jmb
RT1
RT3
RT6
RT5
RT4
RT2
44500 N
44000 N
43500 N
43000 N
42500 N
38500 E
39000 E
39500 E
40000 E
40500 E
41000 E



Centennial Pit Cross Section showing predominance of acid-neutralizing rock (Kd 13, Kbc 14, Kbc 15). This rock will comprise the bulk of backfill into the Sentinel Pit.

LVMC Rock Type Designation

Rock Type (RT) Designation	Rock Type	Bed Number	Acid/base Characteristic
RT1	Quaternary Alluvium	1	ANP
RT2	Mancos Shale	2	ANP
RT3	Dakota Sandstone	3-5	ANP
RT4	Dakota Sandstone	6-8	AGP
RT5	Dakota Siltstone	9-10	AGP
RT6	Dakota Sandstone	11-13	ANP
RT7	Burro Canyon	14-15	ANP

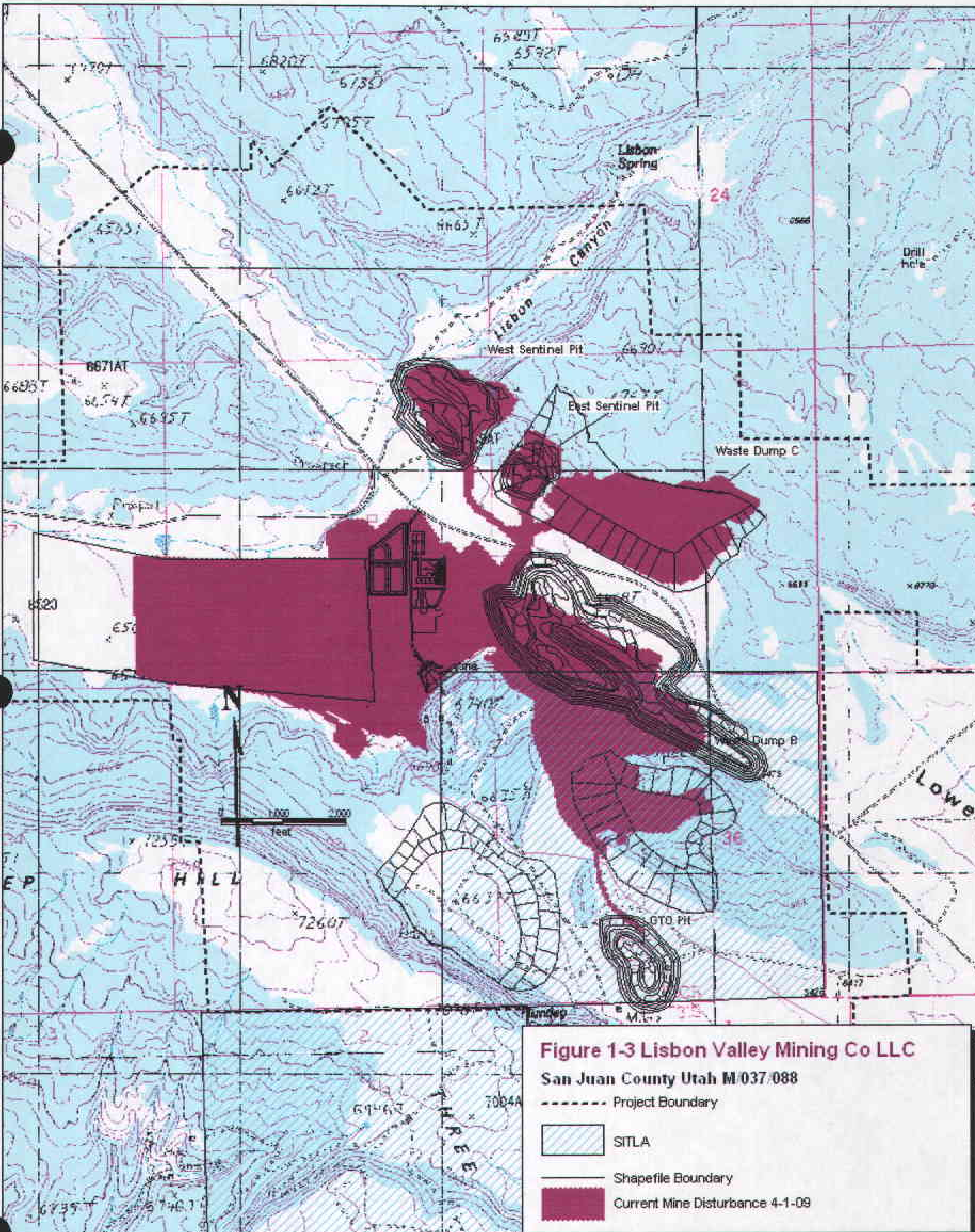


Figure 1-3 Lisbon Valley Mining Co LLC

San Juan County Utah M/037/088

- - - - - - Project Boundary

SITLA

Shapefile Boundary

Current Mine Disturbance 4-1-09

Attachment 2

LISBON VALLEY MINING CO

Table 2
Summary of Environmental Impacts
Sentinel East Backfill Proposal
Lisbon Valley Mining Co LLC
San Juan County, Utah

Environmental Category	Subcategory	Impact	Net Positive/Negative
Geological/Geotechnical		Backfilling eliminates any geotechnical issues relative to high walls.	+
Hydrology	Surface Water	Preserves approx 15 acre/ft surface water.	+
	GW Quality	No change to existing gw model.	
	Groundwater Dewatering	No change to impact.	
	Groundwater Impacts from Leaching and Processing	No change to Impact	
	Erosion and Sedimentation	Reduced erosion along pit walls. Backfill design includes surface water drainage design. No change in sedimentation.	+
Geochemistry	Pit Lake Geochemistry	NA	
	Acid Rock Drainage	Acid-neutralizing rock types comprise pit bottom. Waste rock handling practices encapsulate acid-generating waster with acid-neutralizing waste. Most waste planned for Sentinel East is acid-neutralizing. Overall better alternative than emplacement of acid-generating waste above grade.	
	Heap Leach Pad	No change to impact.	+
Soils and Reclamation		70,000 cu yards growth media required. Approx. 25% will be generated by dump expansion. Remainder is stockpiled approx. 0.6 mi from the pit.	
Vegetation		Reduced pinion/juniper and increased grassland	+
Wildlife		Increased grassland/reduced hazard	+
Grazing		Increased grassland/reduced hazard	+
Cultural		No change to impact	
Visual		Improved view shed	+++
Land Use		Increased grassland/reduced hazard	+
Air Quality		Reduced air emissions in response to shorter waste haul.	++

Attachment 3

Application for Mineral Mine Plan Revision or Amendment

Operator:		
Mine Name:		**File Number: M/ /**

Provide a detailed listing of all changes to the mining and reclamation plan that will be required as a result of this change. Individually list all maps and drawings that are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise or amend the existing Mining and Reclamation Plan. **Include page, section and drawing numbers as part of the description.**

DETAILED SCHEDULE OF CHANGES TO THE MINING AND RECLAMATION PLAN

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	☑ REPLACE	☐ REMOVE	
☐ ADD	☑ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments and obligations, herein.

Print Name _______________ Sign Name, Position _______________

Date _______________

Return to:

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801
Phone: (801) 538-5291 Fax: (801) 359-3940

FOR DOGM USE ONLY:
File #: M/ /
Approved: _______________
Bond Adjustment: from ($) _______________
to $ _______________

O:\FORMS\MR-REV-att.doc

2.4 Project Scope (Page 5)

The scope of the project includes the construction, operation, and reclamation of the ~~1030~~ 1106- acre Lisbon Valley Project Components of this operation are shown on Table 2-1. This table also includes the estimated acreage of each individual facility.

Table 2-1

Facility Pits	Acreage
Centennial	~~116~~ 174
Sentinel #1	38
Sentinel #2	9
GTO	~~68~~ 33
Waste Dumps	
Waste Dump C	163
Waste Dump B	90
Waste Dump A	~~186~~ 120
Leach Pad Area	~~257~~ 266
Process Area and Facilities	~~21~~ 100
Miscellaneous	
Haul Roads	43
Topsoil Stockpiles	~~39~~ 70
Total Project Related Disturbance	~~1030~~ 1106

3.1.3 Ore Stripping (Page 10)

All ore in all pits is scheduled to be broken by drilling and blasting. CAT 740 40-Ton trucks or equal will be loaded with ~~either a 992 or 994~~ a CAT 988 front end loader. The trucks will haul the ore from the pits to an ore stockpile site at the crusher.

3.1.6 Waste Dumps

Three waste dumps with a total combined capacity of 90,000,000 tons at the best available sites were laid out. Current production calls for a total of ~~79,646,000~~ 87,928,430 tons of waste. It was proposed that waste would be dumped at one elevation and dozed over the side of the dump in 40 to 50 foot lifts.

Current design calls for a total of ~~four~~ three waste dumps to dispose of scheduled waste. ~~The dump to the northwest of the Sentinel Pit will hold 9,000,000 tons, which represents all of the waste produced from the main Sentinel Pit.~~ The dump north of the Centennial pit (Waste Dump C) will hold ~~47,000,000~~ 26,349,000 tons, which represents all of the waste from Centennial Phase I and all of the waste from the Sentinel ~~satellite pit~~ pits. The dump west of the GTO pit (Waste Dump A) will hold ~~37,200,000~~ 27,219,000 tons ~~representing all of the waste from GTO. T~~ and the dump to the north of the GTO Pit (Waste Dump B) will hold 31,818,000 tons. ~~accept waste from Centennial and GTO pits and~~ Both dumps will accept waste from Centennial and GTO pits, and will provide additional storage if needed.

Figure 1-3 shows final dump configuration ~~and tonnage~~. Dumps were designed with a 2.5 to 1 slope.

Form MR-Site/Bond Release
(December 21, 2006)

Application for Site and/or Bond Release

Operator/Permittee:

Mine/Project Name: ______________________________

File Number: ______________

Check One:

☐ Large Mine ☐ Small Mine ☐ Exploration

Check one:

☐ Partial Release of a portion of the mine site: Acres to be released: _____ Acres Remaining: _____
Specify Area: ______________________________

☐ Full Release of a portion of the mine site: Acres to be released: _________
Specify Area: ______________________________
(A new map will need to be provided for the Notice or plan removing the released area from the disturbed or bonded area.)

☐ Partial Release of entire mine site: Total Acres to be released: ________
(Backfilling and grading are completed)

☐ Full Release of entire mine site: Total Acres to be released: ________
(Vegetation is established and has survived three growing seasons.)

Amount of Existing Surety: ______________

Amount of Surety requested for release: ______________

Reason for Bond Release Request:

Complete this section if the money released from this application is to be used as surety for future disturbance.

Release bond on: ________ Acres (specify area) ______________________________

Apply Bond to: ________ Acres (specify area) ______________________________

Check Applicable Boxes		DESCRIPTION of RECLAMATION ACTIVITIES COMPLETED (Describe any variance(s) that have been granted, date activity completed)
	Wells Plugged / shafts sealed	
	Disposal of debris & other materials incident to mining	

	Drainages, reestablished & stable	
	Structures demolished / removed	
	Regrading Completed – Slopes, pits, highwalls in stable condition	
	Meets Postmining Land Use (Indicate Landuse)	
	Roads Reclaimed	
	Dams, Impoundments, Ditches, Pits reclaimed	
	Topsoil respread – amendments added	
	Erosion Controlled	
	Vegetation meets 70% of premining cover and has survived three years for full bond release – or has survived one year growing season to maintain small mine status.	

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments and obligations, herein.

Print Name ______________________

Sign Name, Position ______________________

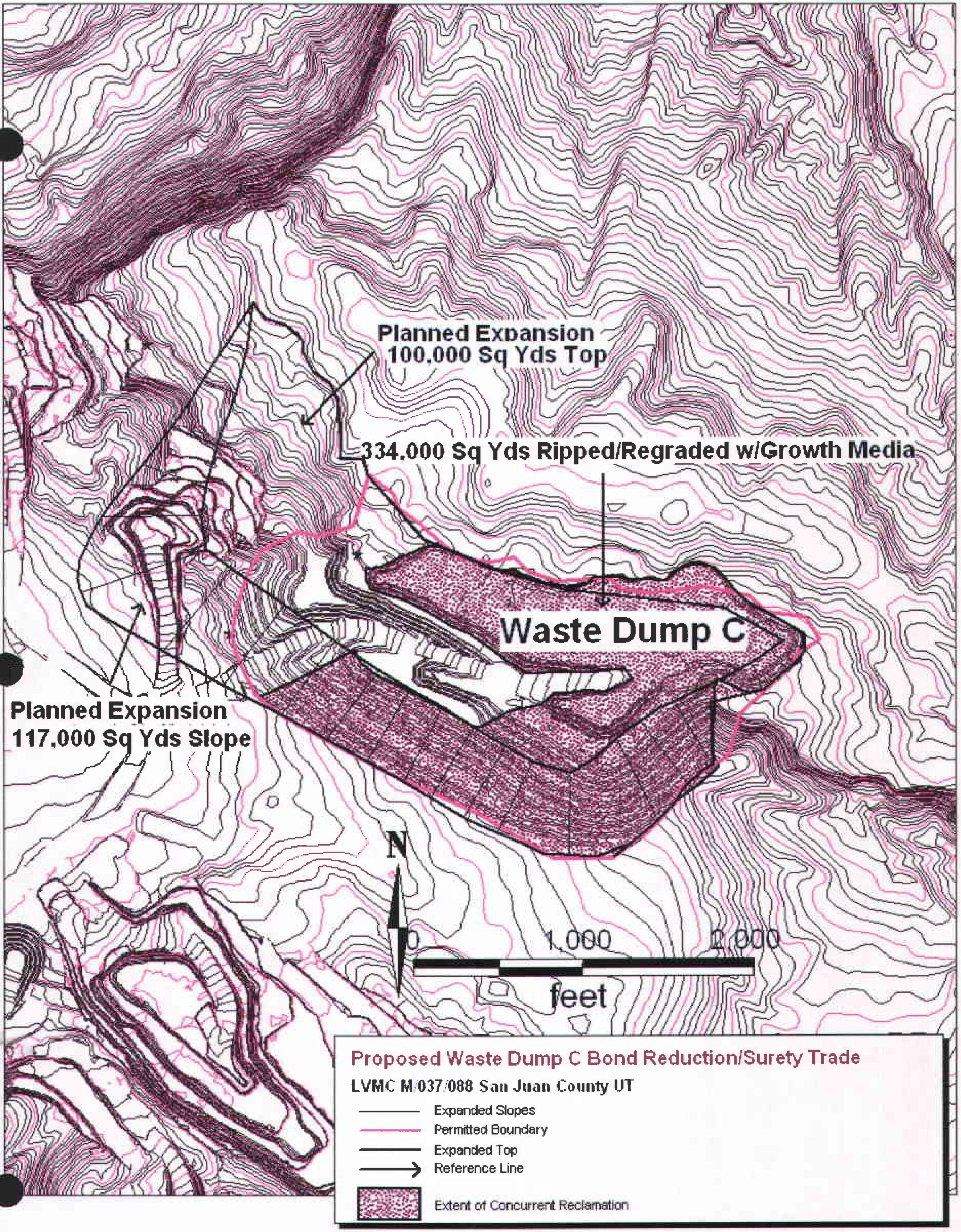
Date ______________________

Return to:

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801
Phone: (801) 538-5291 Fax: (801) 359-3940

FOR DOGM USE ONLY:
File #: M/ /
Approved:
Bond Adjustment: from ($)
to $

O:\FORMS\Bonding Forms\Bond-Release\site-bond-release-applic.doc



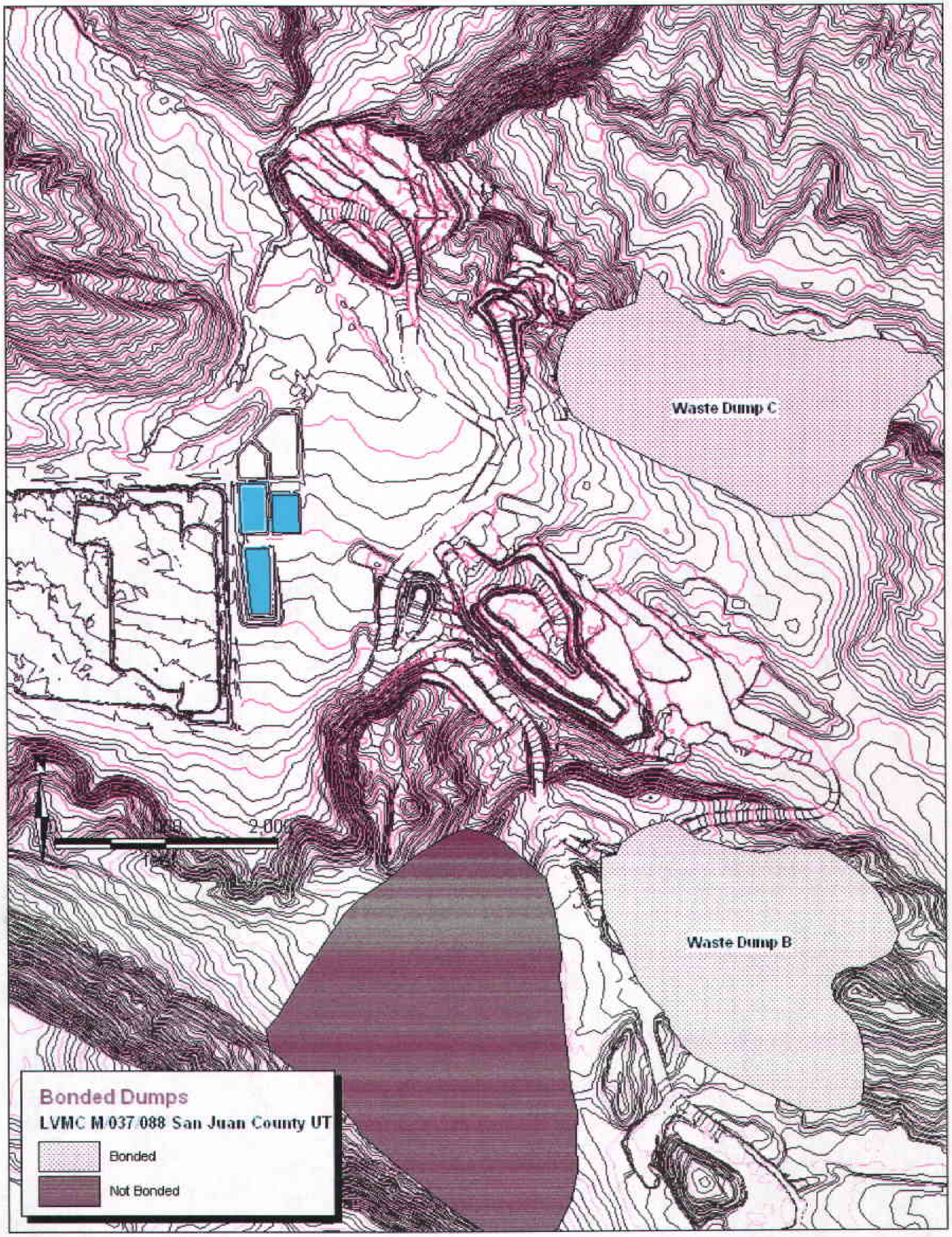
Planned Expansion
100,000 Sq Yds Top
334,000 Sq Yds Ripped/Regraded w/Growth Media
Waste Dump C
Planned Expansion
117,000 Sq Yds Slope
N
0
1,000
2,000
feet
Proposed Waste Dump C Bond Reduction/Surety Trade
LVMC M/037/088 San Juan County UT
Expanded Slopes
Permitted Boundary
Expanded Top
Reference Line
Extent of Concurrent Reclamation

LISBON VALLEY MINING CO

Dump C Bond Release Request
4-23-09

Waste Dump C- Concurrent Reclamation	Area	Quantity	Units		1997 Cost	2009 Cost
area of the top	143,000		SY			
area of the slope	191,000		SY			
scarify top (flat) area		143,000	SY	0.20	$ 28,600	$ 38,140
12 inches soil on top of dump		47,619	CY	1.25	$ 59,524	$ 81,920
12 inches soil on slope		63,603	CY	1.25	$ 79,504	$ 112,919
Total-waste dump "C" reclamation					$ 167,628	$ 232,979

Escalation Schedule	
0	$1.0000
1998	$1.02580
1999	$1.05227
2000	$1.07941
2001	$1.10726
2002	$1.13583
2003	$1.16513
2004	$1.19520
2005	$1.22603
2006	$1.23903
2007	$1.25216
2008	$1.29223
2009	$1.33358
2010	$1.37626
2011	$1.42030


Waste Dump C
Waste Dump B
Bonded Dumps
LVMC M/037/088 San Juan County UT
Bonded
Not Bonded

LISBON VALLEY MINING CO

Mr. Lynn Jackson
US Bureau of Land Management
82 East Dogwood
Moab Utah 84532

July 10, 2009

Mr. Paul Baker
Utah Division of Oil, Gas, & Mining
1594 West North Temple Suite 1210
Salt Lake City, UT 84114-5801

Re: Response to Comments Proposed Mine Plan Amendment. Sentinel East Backfilling. Lisbon Valley Mining Company LLC. 920 South County Road 313, La Sal, Utah, 84530.
BLM Ref. 3809 (UTY02) UTU-72499

Dear Lynn and Paul:

The Lisbon Valley Mining Co LLC (LVMC) respectfully responds to the above-referenced comments received from the Bureau of Land Management (BLM) June 19, 2009. The specific objective of our response is to demonstrate that backfilling the Sentinel East Pit (SE Pit) will not cause an adverse impact to groundwater in the area. This is due to the following factors:

- The BC aquifer is localized and occurs perched on the Morrison Formation.
- The SE Pit is positioned above and east of the BC aquifer.
- Recharge to the BC aquifer is extremely limited.
- Sufficient quantities of acid-neutralizing waste (ANP) are available to encapsulate potential acid-generating waste (AGP).
- Backfilling and diversion will eliminate any surface water or pit wall run-off into the former pit.
- Precipitation into the pit will be eliminated by evapotranspiration (ET).

Our response addresses Reasons 1, 2, and 5 of comments received. It is our understanding that BLM does not require additional information regarding Reasons 3 and 4. Ms. Wyman's memo further addresses Reasons 1 and the IBLA Remand in her memo attachment (Attachment A).

Response to Reason #1

Groundwater Elevation

The SE Pit is positioned above the BC aquifer. The groundwater elevation cited in LVMC's proposal was the pre-mining water level at 6250 feet above mean sea level (amsl). This level is 50 feet below the bottom of the pit, and was identified since it is the highest possible water level, and therefore the most conservative. Groundwater will be withdrawn from the BC aquifer and not replaced due to recharge limitations. These withdrawals, along with evaporation from post-mining pit ponds, will permanently position the post-mining groundwater elevation at 6225 feet amsl. This elevation is 75 feet below the bottom of the pit.

Groundwater Areal Extent

The BC aquifer is perched on the Morrison formation. As a result, the areal extent of the aquifer is controlled by the Morrison subsurface topography whose structural contours limit the aquifer to a small (less than 350 acre) region in the central valley floor. The aquifer is bounded on the north by faults which raise the BC above the static water level[1]. The latter information was determined after FEIS and ROD were published. Attachment B includes plan view and section views of the SE Pit relative to the BC aquifer.

Groundwater Movement and Recharge

The BC aquifer leaks vertically into the Morrison Formation. Recharge is extremely limited due to lack of regional subflow and the BC aquifer's elevated position in Lisbon Valley. The following site conditions expand this evaluation.

Movement

Due to its position capping the high mesas, little or no subsurface inflow to the BC aquifer occurs in Lisbon Valley. This condition extends though out SE Utah from San Juan County east into Colorado and south to Arizona. Regionally, groundwater in the BC moves away from Lisbon Valley to the east and down-dip into the Coyote Syncline.[2] However, the BC fault blocks in Lisbon Valley are hydrologically disconnected from this regional aquifer system. In Lisbon Valley, flow in the BC aquifer is vertical (downward) and no horizontal flow paths have been identified.

---

[1] Whetstone Associates 2008. Lisbon Valley Mine – 2007 Annual Hydrogeologic Evaluation Update. March 2008.

[2] United States Geological Survey 1986. Bedrock Aquifers of Eastern San Juan County, Utah, Technical Publication No. 86. 1986.

Recharge

The BC aquifer receives little recharge from precipitation largely due to its position capping the high mesas. Regionally, recharge to the BC aquifer by precipitation infiltration is estimated to be about 5% (USGS 1986).

In Lisbon Valley, the BC aquifer lies as isolated blocks on the collapsed anticline. The blocks step into the valley, dipping westward, detached from the beds at the top of the valley which dip to the east in the Coyote Syncline.

The elevated and isolated position of the BC results in elevated concentrations of salts and a vertical (only) gradient. Recharge is limited to direct precipitation to the pit, pit wall run-off, and inflow through fractures. Due to limited recharge, the hydrologic model simulates the BC aquifer rebounding approximately 25 feet below the pre-mining level in 500 years (Whetstone Associates 2008).

Changes to the Hydrologic Model

Backfilling the Sentinel East Pit does not change the groundwater model because the Sentinel East Pit was excluded from the original simulation due to its relatively small dimensions. In terms of meteoric water, the pit has not been observed to contain standing water, and percolation rates have not been investigated. However backfilling the pit will include diversion of surface drainage around the pit. This, in addition to a properly designed ET cover (Attachment C) will ensure that the waste does not come into contact with meteoric water.

Response to Reason #2

The placement and isolation of waste with acid generation potential (AGP) will be preserved when backfilling the SE Pit. The following conditions and planning address this issue.

- The bottom of the pit is comprised of Rock Types #6 and #7 (Dakota Beds 11-15). This is sandstone with high ANP. Therefore a pre-existing barrier of rock with high ANP separates waste inside the pit from the BC aquifer. (Ref. Attachment B).
- The SE Pit backfill design comprises approximately 9,000 ktons of waste. According to the new mine plan, approximately 6,800 kt of Rock Types #6 and #7 (Dakota Beds 11-14) will be placed in the pit by 3rd Qtr of 2010. This is more than sufficient ANP to fill the pit, and allow waste with AGP to be isolated and encapsulated above.

Response to Reason #5

LVMC has determined the Sentinel East Pit to be mined out due to the limited volumes and grade (<0.1% Cu) of remaining ore.

Response to the Remand

In 2007, LVMC initiated a closure plan for the Sentinel Pits which included a site-specific evaluation of the adequacy of an evapotranspiration (ET) cover. The purpose of the ET cover is to prevent the infiltration from exceeding a pre-determined minimum expressed as a flux through the base of the cover system or as a percentage of total precipitation. The evaluation utilized computer model UNSAT-H. The results demonstrated infiltration rates of less than 0.1inch/year. These results corroborate use of an ET cap in areas on the mine that may appear threatened by metals mobilized by meteoric water. The ET cover, combined with best management waste handling procedures, comprise information that would change the analysis in remand (Ref. Attachment C).

Approval Request

The LVMC appreciates the agencies' ongoing guidance and support as the LVMC continues the planned mine expansion. We look forward to your review, approval, and written request to proceed. Please call Lantz Indergard at (435) 686 9950 #226 or email Lindergard@lisbonmine.com if additional information is needed.

Sincerely,

Lantz Indergard PG
Environmental Manager
Lisbon Valley Mining Co LLC

Attachment A

Whetstone Associates **Technical Memorandum**

To:	Lantz Indergard, Lisbon Valley Mining Company, LLC	**4124I**
From:	Susan Wyman, P.E., P.G.	
Date:	**July 10, 2009**	
Subject:	Response to BLM Reason #1 and Remand, Sentinel East Backfilling	

Lisbon Valley Mining Company LLC (LVMC) proposes to amend the Mine Plan to include backfilling of the Sentinel East Pit. The Open Pit Backfill Alternative had previously been considered and eliminated in the EIS (BLM, 1997a) and Record of Decision (BLM, 1997b). The ROD listed the following five reasons why the Open Pit Backfilling Alternative was not selected:

- Reason 1. Backfilling could potentially impact water quality in underlying ("downgradient") aquifers
- Reason 2. Selective handling of AGP material in surface waste rock dumps would be more feasible and more environmentally protective
- Reason 3. Backfilling the pits would not eliminate the need for external waste rock dumps
- Reason 4. Public safety would be protected by fencing and berming the open pits after mining
- Reason 5. Leaving the pits open (un-backfilled) would allow future resource recovery of lower grade copper remaining in the open pits

BLM is considering whether new hydrologic and geochemical information presented by LVMC and its consultants in the time since the ROD was issued in 1997 justifies a modification to the mine plan to allow backfilling of the Sentinel East Pit, and whether such backfilling would be protective of groundwater resources. These concerns were expressed in a June, 2009, letter to LVMC (BLM, 2009).

Whetstone Associates has reviewed the BLM letter, and compiled additional information to address BLM's questions. Specifically, this memorandum addresses issues related to trace metal (selenium, molybdenum, and arsenic) mobility and hydrogeologic conditions in the Burro Canyon aquifer (i.e., Reason #1 and IBLA Remand).

WATER LEVEL CONSIDERATIONS FOR SENTINEL EAST PIT BACKFILL

The Sentinel East Pit was referred to as the "satellite pit" or "Sentinel Pit 2" during the preparation of the EIS, and was not explicitly modeled in the 1998 geochemical modeling (ABC, 1998) or in subsequent annual update reports. Because the Sentinel East ("satellite") pit was small and did not overlie the Burro Canyon aquifer, numerical modeling of water quality impacts focused only on the main Sentinel [West] Pit. The modeling assumed that incremental impacts to groundwater from the satellite Sentinel East Pit would be negligible compared to the main Sentinel West Pit.

BLM made a valid, sound decision to reject the pit backfilling alternative for the three pits that intersect the water table. For the three primary open pits (Sentinel [West], Centennial, and GTO), groundwater protection relies in part on the pool in the open pit(s) acting as an evaporative sink. Evaporation from the pit pool that will exist in the floor of each major pit long after mining ceases will depress the water table in the Burro Canyon aquifer, such that hydraulic gradients direct groundwater flow in the Burro Canyon aquifer toward the pits. However, since the Sentinel East Pit is located outside the perimeter of the saturated Burro Canyon aquifer, an evaporative sink is not necessary for aquifer protection.

Water levels in the Burro Canyon aquifer near the Sentinel West Pit are currently at 6,220 feet[1] (Figure 1) and hydrologic models have predicted a post-closure water level elevation of 6,225 feet. The pre-mining static water level was 6,250 feet. BLM (2009) questions whether water levels in the Burro Canyon aquifer could rise above the pre-mining static water level and intersect backfill in the Sentinel East Pit.

Whetstone cannot identify a plausible mechanism that would cause water levels to rise to 50 feet above pre-mining static water levels, and that would cause the Burro Canyon Aquifer to expand beyond its pre-mining areal extent. Rather, the evaporative sinks formed by the Sentinel West and Centennial Pits will depress the average water levels in the aquifer well below the pre-mining static water level. BLM and the IBLA agreed with this conclusion in 1996 - 1998, and no new data have been obtained to change this aspect of the hydrogeologic conceptual or numerical models on which this conclusion was based.

Hydrologic studies conducted on site for mine water supply suggest that groundwater recharge is very limited. Avery (1986) and modeling work performed for LVMC indicate that infiltration is approximately 5% of precipitation, or about 0.75 inches per year. Infiltration is in balance with vertical percolation through the Morrison Formation, and a significant additional source for water would be required to fill the aquifer to the floor of the pit.

If water levels were to rise, for some yet unknown reason, it is not clear that the aquifer would expand horizontally below the Sentinel East Pit rather than spill over from the concave surface of the Morrison Formation (Figure 2) or flow horizontally downvalley (southeast). A significant quantity of water would be required to raise the water levels in the Burro Canyon Aquifer to the spill point, or to the floor of the Sentinel East Pit.

[1] The water level in piezometer 98R8 best represents the Burro Canyon aquifer near the Sentinel West pit, and has been relatively stable at 6,220 ft since February 2008.

Figure 1. Water Level Elevations Near Sentinel Pit

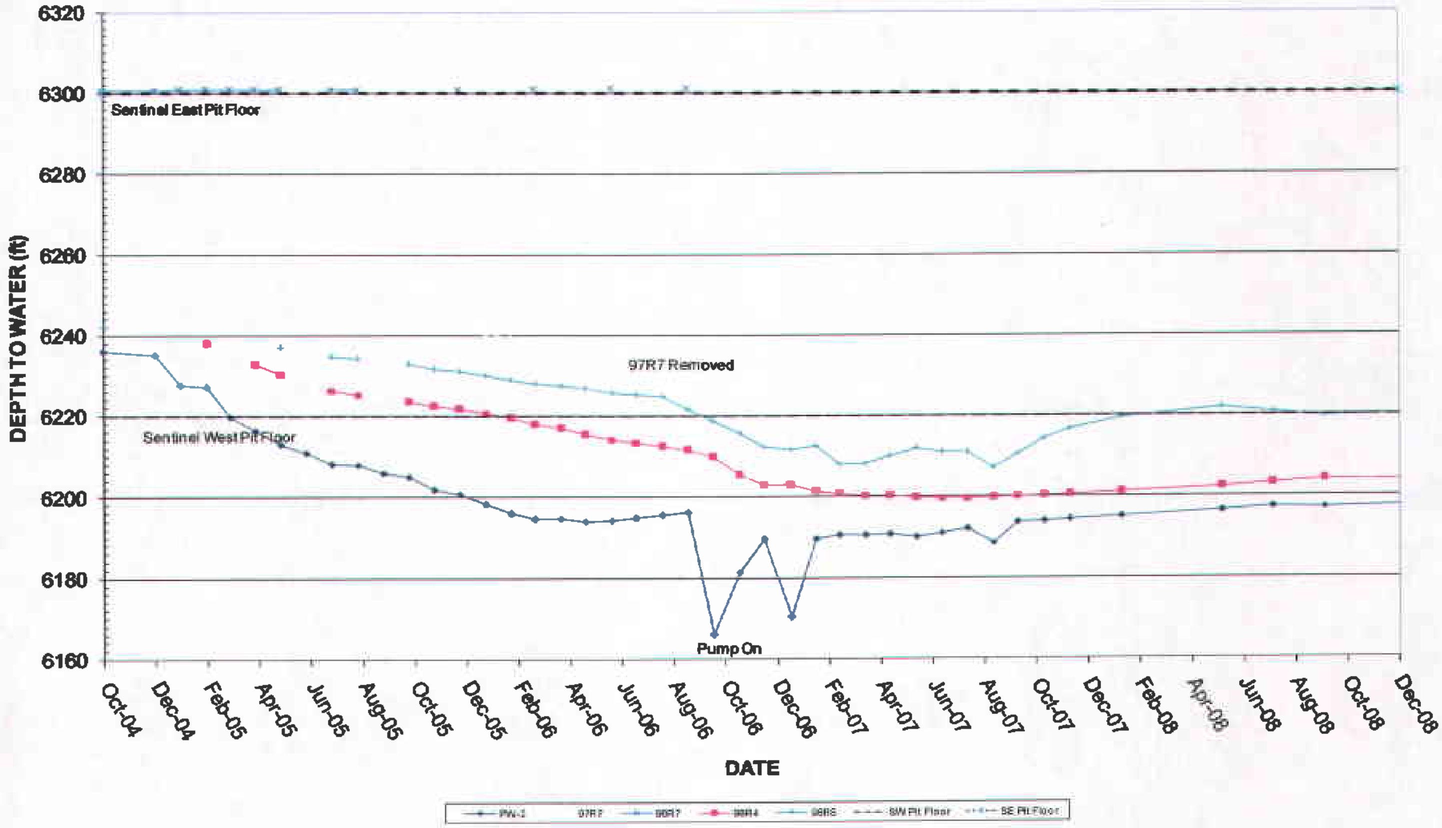


Figure 2. Structural Contour Surface of the Top of the Morrison Formation, Showing Extent of Saturated Burro Canyon Formation (6,180 ft Static Water Level)

(Source: Summo USA in ABC [1998] Figure 20)

Note saturated BC aquifer in blue, and potential spill-over point down-valley (SE) out of the page.

GEOCHEMICAL CONSIDERATIONS FOR SENTINEL EAST PIT BACKFILL

BLM (2009) states that "the existing waste rock data shows selenium, arsenic, and molybdenum are at detectable levels and the existing groundwater data shows a presence of mobilized arsenic, molybdenum, and selenium. ... The data also shows that the increase in mobilization of these elements is directly proportional to the increase in pH."

Results for meteoric water mobility tests (MWMT) conducted on LVMC waste rock samples from the start of mining (2005) to the present are shown in Table 1. Selenium was detected in less than 17% of MWMT results, arsenic in less than 8%, and molybdenum in less than 40%. Although the eight constituents analyzed in MWMT tests were selected by BLM in 1997 because of their potential mobility under elevated pH conditions (Wyman, 1998), the MWMT tests conducted to date do not indicate significant leachability of As, Mo, or Se from site waste rock (Table 1). Similarly, water quality results from wells SLV-3/PW-3 and MW96-7A do not indicate trends of increasing As, Mo, or Se in the Burro Canyon aquifer near the Centennial and Sentinel West Pits (Figure 3, Figure 4). Since 1994, arsenic has been detected in 50% (20/40) of samples from SLV3/PW-3, molybdenum has been detected in 38% (15/40), and selenium has been detected in 41% (16/39), of samples. Similarly, since 1996, arsenic has been detected in 79% (27/34) of samples from MW96-7A, molybdenum has been detected in 82% (28/34), and selenium has been detected in 26% (9/34), of samples. No increasing trends in As, Mo, or Se have been identified. Note that low levels of Mo have been detected in pumping well PW-3 since the galvanized pump column, stainless steel pump, and plastic-coated wiring were installed in 2006. There are no established Utah Groundwater Protection Levels (GWPLs) for molybdenum (UAC R317-6).

Loading rates from the Sentinel East Pit backfill are expected to be lower than those observed in the MWMT tests, due to the lower predicted flux rates through the backfill.

CONCLUSIONS

BLM has questioned whether the proposed mine plan amendment for backfilling the Sentinel East Pit will be environmentally protective and meet the conditions of the EIS, ROD, and IBLA decision. Whetstone Associates has identified that the Sentinel East Pit does not overly the Burro Canyon Aquifer, and the post-mining water table will not intersect the floor of the Sentinel East Pit. There is no mechanism for water levels in the Burro Canyon Aquifer to rise 50+ feet above pre-mining static water levels (instead, the local water table in will be depressed below pre-mining static due to evaporation from the Centennial and Sentinel West Pits). If water levels in the Burro Canyon Aquifer were to rise by some yet unforeseen mechanism, the aquifer would most likely "spill over" from the concave surface of the lower confining unit (Morrison Formation) and flow downvalley southeast, rather than rise up to the floor of Sentinel East Pit.

MWMT tests results indicated that the mobility of arsenic, selenium, and molybdenum from waste rock is limited.

Table 1. Waste Rock Meteoric Water Mobility Test (MWMT) Results

Pit	Sample ID	Date	Antimony	Arsenic	Cadmium	Copper	Molybdenum	Selenium	Uranium	Zinc
Sentinel West	Sent.West	4th Qtr 2005	<0.0004	<0.04	<0.005	0.05	<0.01	<0.04	0.0003	0.01
Sentinel West	Sent.West	1st Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0011	<0.01
Sentinel West	Sent W 14 6380-6400	2nd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0026	<0.01
Sentinel West	Sent W 6380 14	3rd Qtr 2006	0.0009	<0.04	<0.005	<0.01	<0.01	<0.04	0.0007	<0.01
Sentinel West	Sent W 6340 Bed 6-8	4th Qtr 2006	0.0008	0.06	0.060	0.03	<0.01	<0.04	0.0820	1.89
Sentinel West	Sent W 6340 Bed 3-5	4th Qtr 2006	<0.0004	<0.04	0.001	0.04	<0.01	<0.04	0.0093	0.37
Sentinel West	Sent W 6340 Bed 9-10	4th Qtr 2006	<0.0004	<0.04	0.029	0.06	<0.01	<0.04	0.0176	1.44
Sentinel West	Sent W Bed 14	4th Qtr 2006	<0.0004	<0.04	<0.005	<0.01	0.01	<0.04	0.0018	<0.01
Sentinel West	Sent W 6320 Bed 6-8	1st Qtr 2007	<0.0004	<0.04	0.123	0.26	<0.01	<0.04	0.3430	2.27
Sentinel West	Sent W 6320 Bed 14	1st Qtr 2007	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0038	0.02
Sentinel West	Sent W 6320 Bed 3-5	1st Qtr 2007	<0.0004	<0.04	<0.005	0.06	<0.01	<0.04	0.0010	0.11
Sentinel West	Sent W 6300 Bed 6-8	2nd Qtr 2007	0.0006	<0.04	0.061	0.35	<0.01	<0.04	0.0319	1.74
Sentinel West	Sent W 6300 Bed 14	2nd Qtr 2007	0.0005	<0.04	<0.005	<0.01	0.01	<0.04	0.0155	0.02
Sentinel West	Sent W 6260 Bed 9-10	2nd Qtr 2007	0.0009	<0.04	<0.005	<0.01	0.07	<0.04	0.0051	0.03
Sentinel West	Sent W 6220 Bed 3-5	2nd Qtr 2007	<0.0004	<0.04	0.005	0.06	<0.01	<0.04	0.0007	0.22
Sentinel West	Sent W 6220 Bed 9-10	3rd Qtr 2007	0.0024	<0.04	<0.005	<0.01	0.83	0.08	0.0114	<0.01
Sentinel East	Sent. East	4th Qtr 2005	<0.0004	<0.04	<0.005	0.02	<0.01	<0.04	0.0021	0.01
Sentinel East	Sent. East	1st Qtr 2006	<0.0004	<0.04	<0.005	<0.01	0.02	<0.04	0.0008	<0.01
Sentinel East	Sent E9-10 6380-6400	2nd Qtr 2006	<0.0004	<0.04	0.028	0.10	<0.01	<0.04	0.0021	2.03
Sentinel East	Sent E 6-8 6380-6420	2nd Qtr 2006	<0.0004	<0.04	0.014	12.50	<0.01	0.05	0.0011	0.77
Sentinel East	Sent E11-13 6380-6400	2nd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	0.02	<0.04	<0.0001	0.09
Sentinel East	Sent E 14 6380-6400	2nd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	<0.0001	0.03
Sentinel East	Sent E 6340 3-5	2nd Qtr 2006	<0.0004	<0.04	0.008	0.23	<0.01	<0.04	0.0028	0.04
Sentinel East	Sent E 6340 11-13	3rd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	0.06	<0.04	0.0003	0.02
Sentinel East	Sent E 6340 14	3rd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0012	<0.01
Sentinel East	Sent E 6340 9-10	3rd Qtr 2006	<0.0004	<0.04	0.008	0.11	<0.01	<0.04	0.0018	1.13
Sentinel East	Sent E 6340 6-8	3rd Qtr 2006	<0.0004	<0.04	0.026	0.07	<0.01	<0.04	0.0482	3.95
Sentinel East	Sent E 6300 Bed 14	4th Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0014	<0.01
Centennial	Cent. 6-8	4th Qtr 2005	<0.0004	<0.04	0.011	0.20	<0.01	<0.04	0.0021	0.46
Centennial	Cent. 6-10	4th Qtr 2005	<0.0004	<0.04	<0.005	<0.01	<0.01	0.04	0.0008	0.04
Centennial	Cent. 11-13	4th Qtr 2005	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0004	<0.01
Centennial	Cent. 14	4th Qtr 2005	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0022	<0.01
Centennial	Cent 6420 Bed 14	1st Qtr 2006	<0.0004	<0.04	<0.005	<0.01	0.01	<0.04	0.0009	<0.01
Centennial	Cent 6420 Bed 9-10	1st Qtr 2006	0.001	<0.04	<0.005	<0.01	0.02	<0.04	0.0004	<0.01
Centennial	Cent 6420 Bed 11-13	1st Qtr 2006	<0.0004	<0.04	<0.005	<0.01	0.02	<0.04	0.0002	<0.01
Centennial	Cent 6420 Bed 6-8	1st Qtr 2006	<0.0004	<0.04	0.104	18.80	<0.01	<0.04	0.0003	0.68
Centennial	Cent Bed 14 6420	2nd Qtr 2006	<0.0004	<0.04	<0.005	0.01	0.03	<0.04	0.0003	<0.01
Centennial	Cent Bed 9-10 6420	2nd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0004	<0.01
Centennial	Cent Bed 11-13 6420	2nd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	<0.0001	<0.01
Centennial	Cent 6400 6-8	3rd Qtr 2006	<0.0004	<0.04	4.67	9.47	<0.01	<0.04	0.0400	10.90
Centennial	Cent 6400 14	3rd Qtr 2006	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0007	<0.01
Centennial	Cent 6400 11-13	3rd Qtr 2006	<0.0004	<0.04	0.006	0.01	<0.01	<0.04	0.0160	<0.01
Centennial	Cent 6400 9-10	3rd Qtr 2006	<0.0004	<0.04	2.110	3.08	0.01	<0.04	0.0013	1.62
Centennial	Cent 6400 3-5	3rd Qtr 2006	<0.0004	<0.04	0.095	0.10	<0.01	<0.04	<0.0001	0.11
Centennial	Cent Bed 11-13	4th Qtr 2006	0.0005	<0.04	<0.005	<0.01	0.01	<0.04	0.0024	<0.01
Centennial	Cent Bed 6-8	4th Qtr 2006	<0.0004	<0.04	7.290	56.90	<0.01	<0.04	0.0440	4.90
Centennial	Cent Bed 9-10	4th Qtr 2006	<0.0004	<0.04	3.880	3.42	<0.01	<0.04	0.1110	14.90
Centennial	Cent Bed 14	4th Qtr 2006	0.0005	<0.04	<0.005	<0.01	<0.01	<0.04	0.0013	<0.01
Centennial	Cent Bed 3-5	4th Qtr 2006	<0.0004	<0.04	1.080	0.81	<0.01	<0.04	0.0010	5.49
Centennial	Cent 6380 Bed 9-10	1st Qtr 2007	<0.0004	<0.04	0.887	1.52	<0.01	0.04	0.0404	17.70
Centennial	Cent 6380 Bed 6-8	1st Qtr 2007	0.0023	0.05	1.550	0.25	<0.01	<0.04	0.0596	12.00
Centennial	Cent 6380 Bed 14	1st Qtr 2007	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0007	0.01
Centennial	Cent 6400	1st Qtr 2007	<0.0004	<0.04	0.712	19.20	<0.01	<0.04	<0.0001	2.27
Centennial	Cent 6380 Bed 2	1st Qtr 2007	0.0037	<0.04	<0.005	<0.01	0.01	0.06	0.0065	<0.01
Centennial	Cent 6380 Bed 11-13	1st Qtr 2007	<0.0004	<0.04	<0.005	0.02	<0.01	<0.04	0.0004	<0.01
Centennial	Cent 6380 Bed 6-8	2nd Qtr 2007	0.0027	<0.04	5.000	99.40	<0.01	<0.04	0.0377	15.70
Centennial	Cent 6360 Bed 14	2nd Qtr 2007	0.0006	<0.04	<0.005	0.04	<0.01	<0.04	0.0047	0.02
Centennial	Cent 6360 Bed 3-5	2nd Qtr 2007	<0.0004	<0.04	2.850	10.40	<0.01	<0.04	0.0002	3.83
Centennial	Cent 6360 Bed 2	2nd Qtr 2007	0.0014	<0.04	<0.005	0.04	0.02	0.05	0.0014	0.02
Centennial	Cent 6360 Bed 11-13	2nd Qtr 2007	0.0005	<0.04	0.008	0.03	0.09	<0.04	0.0047	0.06
Centennial	Cent 6360 Bed 9-10	2nd Qtr 2007	<0.0004	<0.04	0.649	0.36	<0.01	<0.04	<0.0001	0.95
Centennial	Cent 6340 Bed 11-13	3rd Qtr 2007	0.0018	<0.04	0.006	0.04	0.38	<0.04	0.0150	<0.01
Centennial	Cent 6340 Bed 14	3rd Qtr 2007	<0.0004	<0.04	<0.005	0.03	<0.01	<0.04	0.0013	<0.01
Centennial	Cent 6340 Bed 3-5	3rd Qtr 2007	0.0005	0.04	12.900	394.00	<0.01	0.11	0.0073	76.00
Centennial	Cent 6340 Bed 6-8	3rd Qtr 2007	<0.0004	0.05	3.540	14.30	<0.01	<0.04	0.0011	20.50
Centennial	Cent 6340 Bed 9-10	3rd Qtr 2007	0.0046	<0.04	<0.005	0.01	1.68	0.07	0.0073	<0.01
Centennial	Cent 6340 Bed 2	3rd Qtr 2007	0.0048	0.04	<0.005	0.02	0.12	<0.04	0.0029	<0.01
Centennial	Cent 6300 Bed 14	4th Qtr 2007	<0.0004	<0.04	<0.005	<0.01	<0.01	<0.04	0.0052	<0.01
Centennial	Cent 6300 Bed 6-8	4th Qtr 2007	<0.0004	<0.04	0.434	2.32	<0.01	0.04	0.0007	2.35
Centennial	Cent 6300 Bed 3-5	4th Qtr 2007	<0.0004	<0.04	0.325	0.07	0.01	<0.04	0.0019	0.31
Centennial	Cent 6300 Bed 11-13	4th Qtr 2007	0.0005	<0.04	0.012	0.03	0.01	<0.04	0.0048	0.58
Centennial	Cent 6300 Bed 9-10	4th Qtr 2007	0.0011	<0.04	0.126	0.27	0.08	<0.04	0.0211	0.40
Centennial	Cent 6460 Bed 2	4th Qtr 2007	<0.0004	<0.04	<0.005	<0.01	0.03	0.07	0.0165	<0.01
GTO	GTO 6440 Bed 2	2nd Qtr 2007	<0.0004	<0.04	<0.005	<0.01	<0.01	0.07	0.0037	0.02
GTO	GTO 6440 Bed 6-8	2nd Qtr 2007	<0.0004	<0.04	0.007	0.05	<0.01	<0.04	<0.0001	0.05
GTO	GTO 6440 Bed 6-8	3rd Qtr 2007	0.0008	<0.04	0.020	0.06	<0.01	0.05	0.0025	2.98
GTO	GTO 6440 Bed 2	3rd Qtr 2007	0.0004	0.05	<0.005	0.01	0.02	0.10	0.0080	<0.01
	Average		**0.0006**	**0.022**	**0.633**	**8.43**	**0.05**	**0.06**	**0.0144**	**2.75**
	# Non Detects		**54**	**71**	**41**	**30**	**53**	**64**	**7**	**29**
	Total Samples		77	77	77	77	77	77	77	77
	% Non Detect (ND)		**70.1%**	**92.2%**	**53.2%**	**39.0%**	**68.8%**	**83.1%**	**9.1%**	**37.7%**

Note: Average calculated using ½ D.L. for non-detected results.

Figure 3. Arsenic, Molybdenum, and Selenium Concentrations over Time in the Wells SLV3/PW-3 (Burro Canyon Aquifer) near the Centennial and Sentinel West Pits

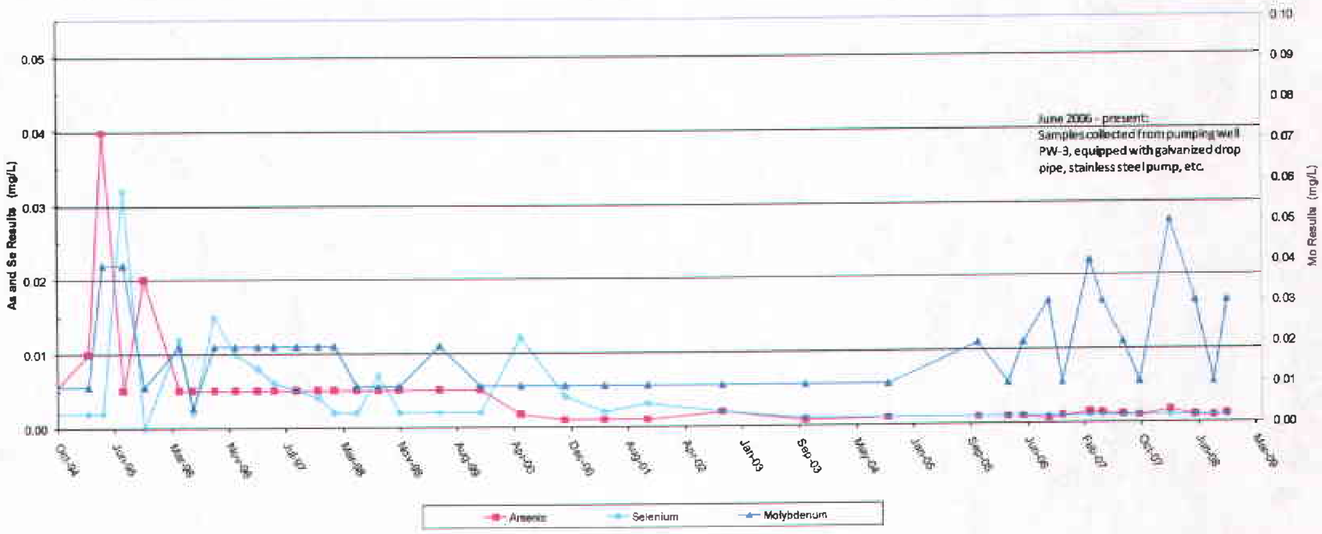
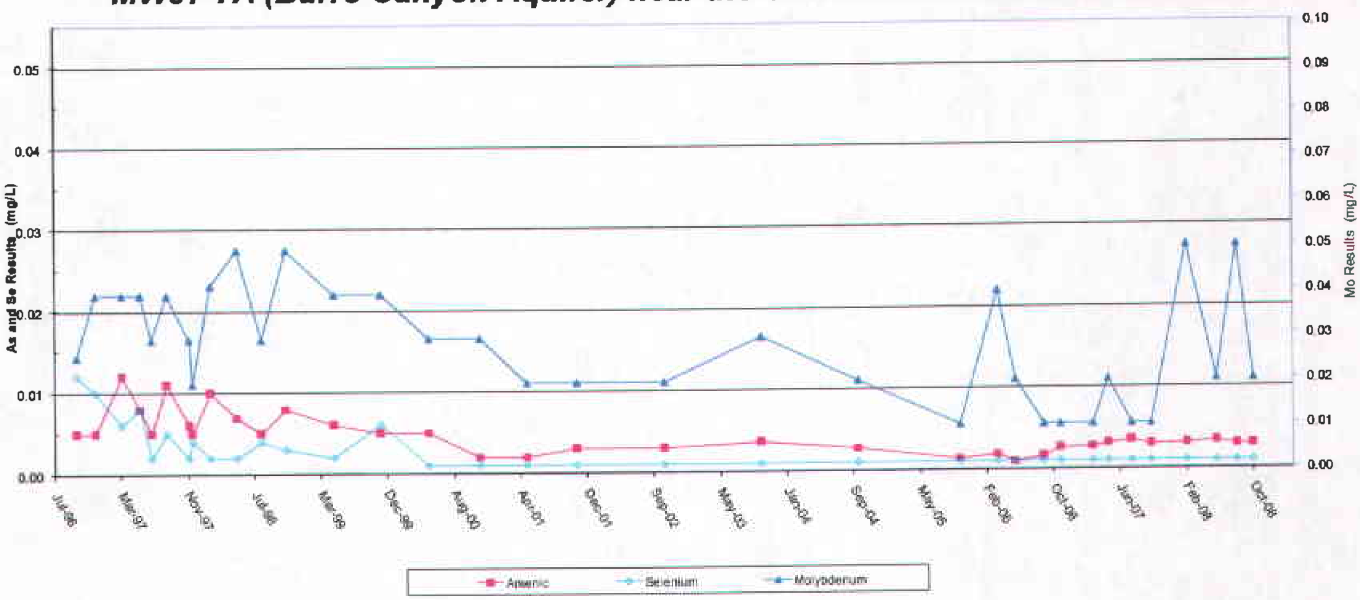


Figure 4. Arsenic, Molybdenum, and Selenium Concentrations over Time in the Well MW97-7A (Burro Canyon Aquifer) near the Centennial and Sentinel West Pits



REFERENCES

ABC, 1998. Annual Update of the Lisbon Valley Hydrogeologic System Evaluation, prepared by Adrian Brown Consultants, Inc. for Summo USA Corporation, Report 1424A/980119. January 1998.

Avery, C., 1986. Bedrock Aquifers of Eastern San Juan County, UT. State of Utah Department of Natural Resources Technical Publication No. 86.

Hem, John D., 1985. Study and Interpretation of the Chemical Characteristics of Natural Water, Third Edition, U.S. Geological Survey Water Supply Paper 2254. 263 pp.

Interior Board of Land Appeals (IBLA), 1998. National Wildlife Federation, *et al.*, 145 IBLA 348, September 23, 1998

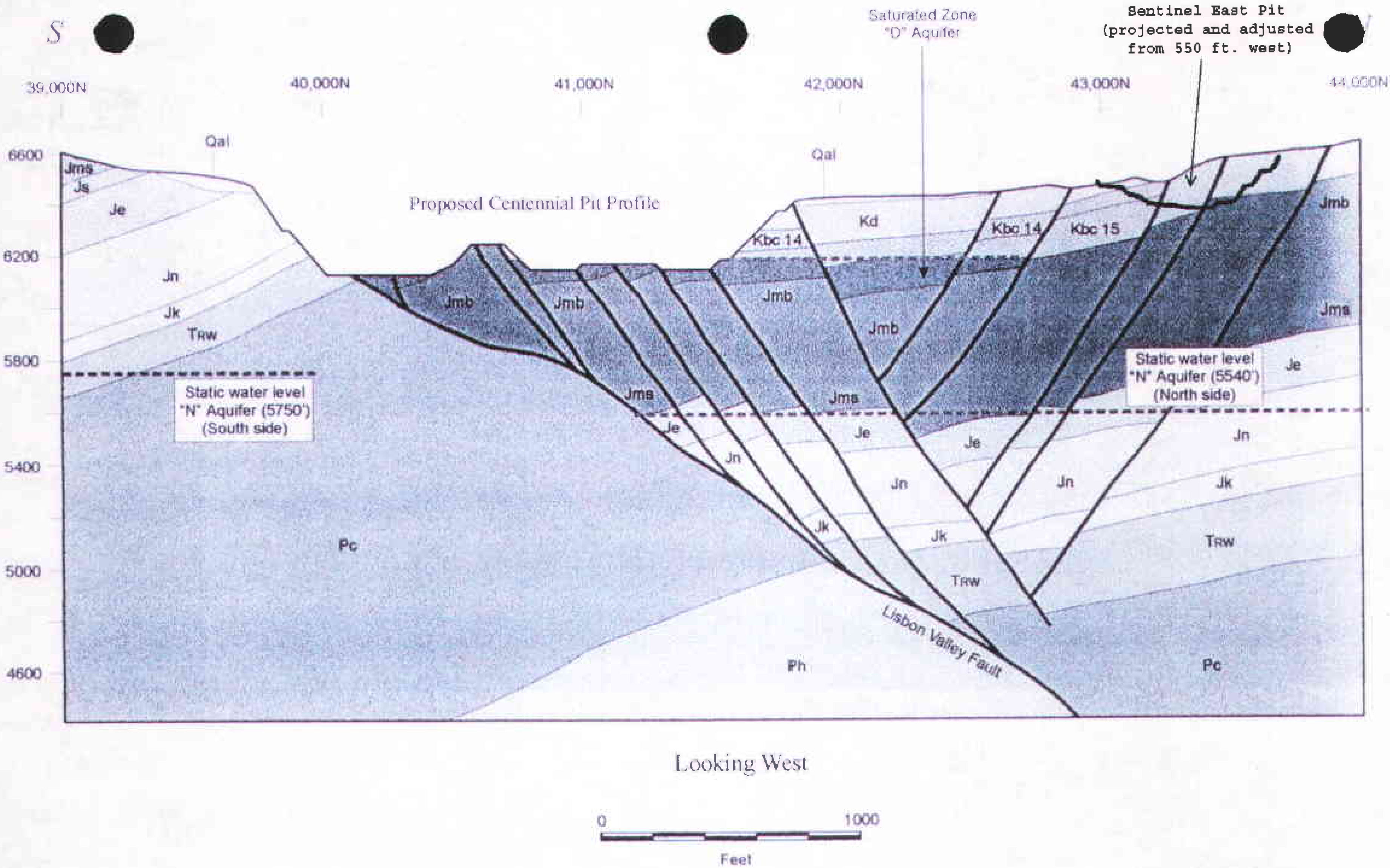
BLM, 1997a. Environmental Impact Statement (EIS) for the Lisbon Valley Copper Project, prepared by the Bureau of Land Management (BLM) Moab Field Office. February 1997.

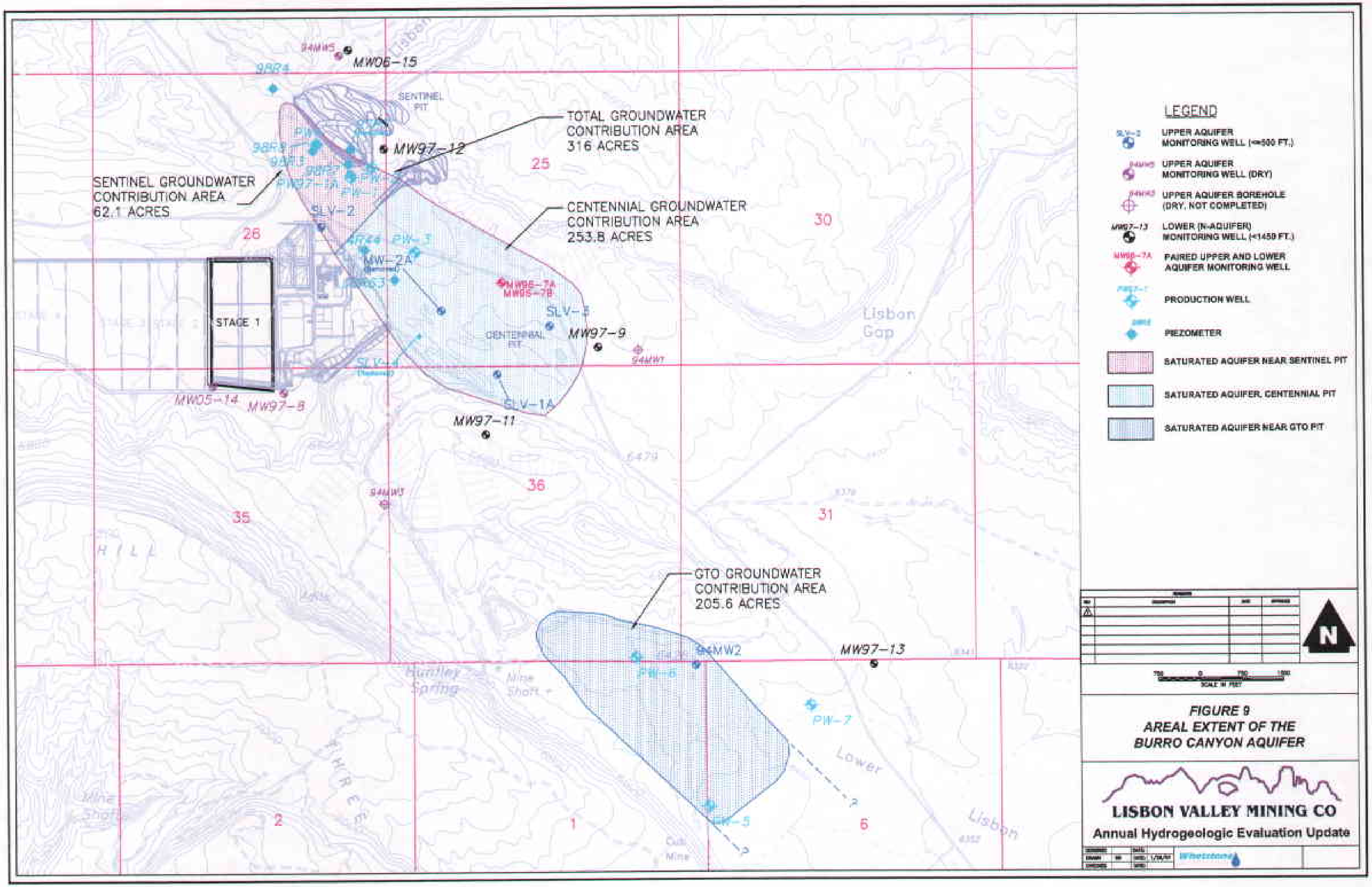
BLM, 1997b. Record of Decision (ROD), Environmental Impact Statement, Lisbon Valley Copper Project, prepared by the Bureau of Land Management (BLM) Moab Field Office. March 26, 1997.

BLM, 2009. "Mine Plan Modification-Backfill the Sentinel East Pit-More Information Requested", Letter to Mr. Lantz Indergard, LVMC, from A. Lynn Jackson, BLM. June 2009.

Wyman, 1998. "Trace Metal Modeling, Lisbon Valley Copper Project," technical memorandum to Bill White (BLM) from Susan Wyman (ABC), February 17, 1998

Attachment B


S
Saturated Zone
"D" Aquifer
Sentinel East Pit
(projected and adjusted
from 550 ft. west)
39,000N
40,000N
41,000N
42,000N
43,000N
44,000N
6600
6200
5800
5400
5000
4600
Qal
Qal
Proposed Centennial Pit Profile
Jms
Js
Je
Jn
Jk
TRW
Kd
Kbc 14
Kbc 14
Kbc 15
Jmb
Jms
Static water level
"N" Aquifer (5750')
(South side)
Static water level
"N" Aquifer (5540')
(North side)
Pc
Ph
Lisbon Valley Fault
Looking West
0
1000
Feet



TOTAL GROUNDWATER
CONTRIBUTION AREA
316 ACRES
SENTINEL GROUNDWATER
CONTRIBUTION AREA
62.1 ACRES
CENTENNIAL GROUNDWATER
CONTRIBUTION AREA
253.8 ACRES
GTO GROUNDWATER
CONTRIBUTION AREA
205.6 ACRES
SENTINEL PIT
CENTENNIAL PIT
STAGE 1
MW06-15
MW97-12
MW97-9
MW97-11
MW97-13
MW05-14
MW97-8
SLV-2
SLV-3
SLV-1A
SLV-4
MW-2A
PW-3
PW-5
PW-6
PW-7
94MW2
94MW1
94MW3
94MW5
98R4
MW96-7A
MW95-7B
Lisbon Gap
Lower Lisbon
Huntley Spring
Mine Shaft
Cut Mine
HILL
25
26
30
31
35
36
1
2
6
LEGEND
UPPER AQUIFER MONITORING WELL (<=500 FT.)
UPPER AQUIFER MONITORING WELL (DRY)
UPPER AQUIFER BOREHOLE (DRY, NOT COMPLETED)
LOWER (N-AQUIFER) MONITORING WELL (<1450 FT.)
PAIRED UPPER AND LOWER AQUIFER MONITORING WELL
PRODUCTION WELL
PIEZOMETER
SATURATED AQUIFER NEAR SENTINEL PIT
SATURATED AQUIFER, CENTENNIAL PIT
SATURATED AQUIFER NEAR GTO PIT
N
SCALE IN FEET
FIGURE 9
AREAL EXTENT OF THE
BURRO CANYON AQUIFER
LISBON VALLEY MINING CO
Annual Hydrogeologic Evaluation Update
Whetstone

Attachment C

Golder Associates Inc.
44 Union Boulevard, Suite 300
Lakewood, CO USA 80228
Telephone: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

LISBON VALLEY COPPER MINE
ENGINEERING DESIGN OF EVAPOTRANSPIRATION COVERS
FOR THE LISBON VALLEY SENTINEL PITS CLOSURE
SAN JUAN COUNTY, UTAH

Prepared for:

Lisbon Valley Mining Company, LLC
920 South County Road 313
La Sal, Utah 84530

Prepared by:

Golder Associates Inc.
44 Union Boulevard, Suite 300
Lakewood, Colorado 80228-1856

Distribution:

3 Copies – Lisbon Valley Mining Company
1 Copy – Golder Associates Inc.

February 14, 2007 063-2307

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The Lisbon Valley Mining Company, LLC (LVMC), of Moab, Utah, is preparing a closure design for the Sentinel West and Sentinel East (Sentinel Pits) pits located within the Lisbon Valley Copper Mine, San Juan County, Utah, near the town of La Sal, Utah, on South County Road 313. LVMC is a subsidiary of Constellation Copper Corporation, of Lakewood, Colorado. The Lisbon Valley Copper Mine Project is a mining and ore processing facility currently comprised of surface mine pits, crushers, a series of lined ponds, lined heap leach pad, copper recovery plant, and associated infrastructure, all of which were designed and constructed to be in accordance with the requirements established by Title 40, Chapter 8 regulations promulgated by the Utah Mined Land Reclamation Act. The work associated with the Project is being performed under specific criteria established by approved permits from the U.S. Bureau of Land Management and the state of Utah through the National Environmental Protection Act (NEPA) process. This document is prepared as a support document to the closure plan for the Sentinel West and Sentinel East Pits and discusses a site-specific evaluation of the adequacy of an evapotranspiration (ET) cover. Development of the closure grading plans for the Sentinel West and Sentinel East pits is discussed in a separate document (Golder, 2007).

The regional groundwater phreatic surface has been characterized by others, most recently by Whetstone Associates (2007). Groundwater at the Lisbon Valley Mine primarily occurs in two aquifers, the Burro Canyon aquifer (or D-aquifer) which occurs at depths of less than 500 feet and the Navajo aquifer (or N-aquifer) which occurs below about 850 feet. These two aquifer systems are separated by several hundred feet of low-permeability interbedded shale, siltstone, and silty sandstone (Morrison Formation and Summerville Formation), as shown on Figure 1 below. An unsaturated zone exists between the upper and lower aquifers, and water levels indicate that strong downward vertical gradients exist. Water in the upper aquifer percolates slowly downward to the deep N-aquifer. The water quality in the N-aquifer is similar to water in fractures in the upper aquifer, and is generally of slightly better quality than the Burro Canyon aquifer. Pit lake and water quality modeling completed for a no pit backfill scenario predicts a shallow pit lake will occur during the post-closure period. It is our understanding that the potential for a pit lake for a pit backfill scenario with an ET cover has not been evaluated.

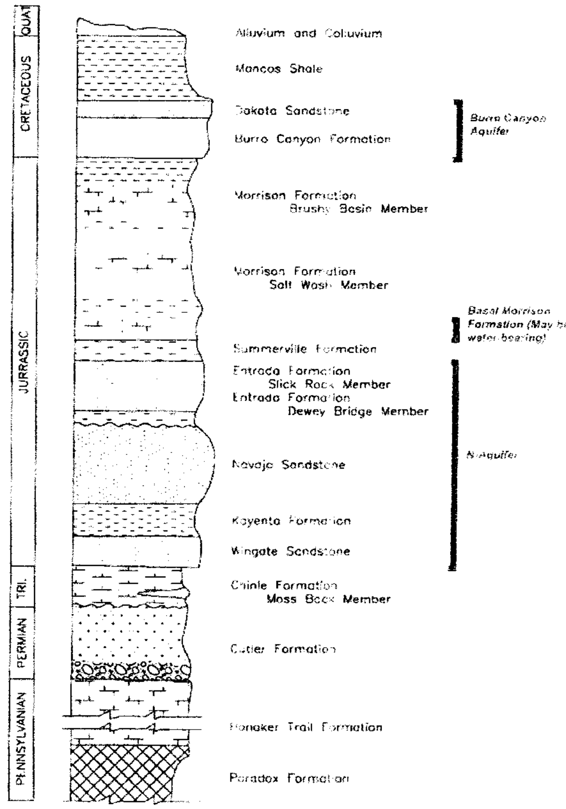


Figure 1. Stratigraphic Column Showing Burro Canyon Aquifer and N-Aquifer

The LVMC closure plan for the Sentinel Pits generally involves the following concepts:

1. Backfill the pits with mine waste. Encapsulate potentially acid generating waste rock with acid-neutralizing waste rock, placed at the base and perimeter of the pit.

2. The backfilled pits will be graded to blend with the natural topography, to simulate pre-pit development and to provide positive surface drainage.

3. Develop surface water diversions upgradient of the reclaimed pits to prevent run-on to the cover during the post-closure period.

4. Construct an ET cover system vegetated with native plant species designated to prevent the percolation of any meteoric flux into the backfilled mine waste during the post-closure period.

The following sections of this document discuss the ET cover adequacy for Sentinel Pits closure.

2.0 TECHNICAL APPROACH

The purpose of the ET cover is to prevent the infiltration from exceeding some pre-determined minimum, typically expressed as a flux through the base of the cover system or as a percentage of total precipitation. Alternatively, the ET cover hydraulic performance may be compared to a pre-determined (prescriptive) cover to determine the ET cover viability. In general, the percolation rates for conventional soil covers and composite barrier layers are typically in the order of 1% or more of total precipitation (Albright et al., 2004). In this study, the ET cover performance is demonstrated through unsaturated flow modeling using the computer model UNSAT-H. As the modeling effort requires relatively detailed climatic information, the weather record from the Monticello NCDC Station 425805 was used. The UNSAT-H input data: climate record, geotechnical and hydraulic information, and vegetation parameters are discussed in more detail in subsequent sections.

The ET cover is envisioned as a 2-foot thick vegetative cover layer seeded with grasses. To obtain soil input parameters, sampling and laboratory analyses of ET cover materials are typically performed. For a feasibility level ET cover performance evaluation, however, it is often sufficient to derive these parameters using the recommended values from the literature and from the available geotechnical properties for site-specific materials. For this study, the existing site-specific data provided in the Lisbon Valley Heap Leach construction documents (Golder, 2006 and J.D. Welsh, 1996) were used to determine ET cover material properties.

A data-base search using the site-specific geotechnical information was employed to develop required unsaturated flow parameters. UNSAT-H vegetation parameters such as the Root Density Function (RDF) and Leaf Area Indices (LAIs) were determined from the available literature and Golder's experience on similar projects taking into consideration the expected climate conditions and estimated soil hydraulic properties.

The UNSAT-H model inputs and results are discussed in more detail in the following sections.

3.0 MODEL CODE

The simulations were conducted using the computer model code UNSAT-H. The UNSAT-H code version 3.01 (Fayer, 2001) was developed by the Pacific Northwest National Laboratory and was designed to simulate water and heat flow processes in one dimension. UNSAT-H, a finite difference model, can simulate the flow of liquid water and water vapor, the surface energy balance, soil-water extraction by plants, infiltration, water storage, water redistribution and deep drainage. The model code is widely accepted by the professional community for cover performance. The UNSAT-H has been recommended by the EPA for the hydraulic analysis and design for the RCRA/CERCLA final covers (EPA, 2002).

4.2 Material Properties

Material properties for UNSAT-H simulations were estimated from laboratory data for on-site soils determined during geotechnical field investigations (J.D. Welsh, 1996 and Golder, 2006). Laboratory data reported by J.D. Welsh (1996), used to estimate soil-water characteristic curves (SWCCs) and hydraulic conductivities, are summarized in the following table:

TABLE 4.4

LABORATORY DATA FOR ON-SITE SOILS (J.D. WELSH, 1996)

Sample	USCS Class.	% gravel	%sand*	%fines	k @ 95% Proctor (cm/s)
1.1C @ 12'	red, sandy clay	0.0	2.7	97.3	
5C300 @ 7' TO 9'	red, sandy silt	0.0	29.9	70.1	
2E @ 4'	red, sandy silt	2.0	36.5	61.5	
3G5 @ 11'	red, sandy silt	0.1	7.2	92.7	
5F200	red, silty sand	35.5	27.3	37.2	
2.25C200	red, sandy clay	0.0	16.7	83.3	
COMPOSITE - Shepherd Miller	red sandy silt	2.0	35.5	62.5	~1.5E-07
COMPOSITE Advanced Terra Testing	clayey sand	15	50	35	1.7e-8

* sand fraction considered material size larger than 0.075 mm and smaller than 2 mm

Laboratory data for on-site soils determined by Golder (2006) are summarized in Table 4.5

TABLE 4.5

LABORATORY DATA FOR ON-SITE SOILS (GOLDER, 2006)

Sample	USCS Class.	% gravel	%sand*	%fines
QA-SF-01	reddish brown, sandy silt	3.1	44.9	52
QA-SF-2	reddish brown, silty sand	0.7	49.6	49.7
QA-SLF-1	reddish brown, silty sand	1.2	34.2	64.6
QA-SLF-2	reddish brown, silty sand	0.1	21.0	78.9
QA-SLF-3	reddish brown, silty sand	0.7	30.0	69.3
QA-SLF-4	reddish brown, silty sand	2.7	36.5	60.8
QA-SLF-5	reddish brown, silty sand	0.5	44.3	55.2

* sand fraction considered material size larger than 0.075 mm and smaller than 2 mm

Soil-water characteristic curves were determined by comparing the lab determined grain-size distributions for on-site soils with soils in the SoilVision database as shown in the attached figures. The SWCCs data from the SoilVision database were than used to establish the likely range of van Genuchten parameters shown in the following table:

TABLE 4.6

HYDRAULIC PROPERTIES USED FOR UNSAT-H SIMULATIONS

Material Type Estimate	Limit	alpha (1/cm)	n (-)	θ_r (-)	θ_{sat} (-)	Ksat (cm/s)
Type 1	Lower	0.0153	1.28	0.000	0.320	2.25×10^{-5}
Type 2	Mean	0.0163	1.17	0.000	0.430	2.25×10^{-5}
Type 3	Upper	0.0173	1.13	0.000	0.540	2.25×10^{-5}

The saturated conductivity value in Table 4.6 was estimated as a geometric mean for the SoilVision soils with the grain-size distribution similar to the on-site soils in Tables 4.4 and 4.5. The chosen hydraulic conductivity value compares favorably with the estimates based on the laboratory data and modified Kozeny-Carman equation (e.g., Freeze and Cherry, 1979). The van Genuchten (1980) equation required for UNSAT-H modeling is a continuous function:

$$\theta = \theta_r + \frac{\theta_s - \theta_r}{\left[1 + (\alpha h)^n\right]^m} , \qquad (5)$$

where θ is the volumetric water content, θ_r is the residual water content, θ_{sat} is the saturated water content, h is the suction, and a, n, and m are fitting parameters. In most applications m is set equal to $1\text{-}1/n$. The parameters a and n define the shape of the SWCC represented by Equation 5. These parameters reflect the pore size distribution in the soil, as well as the affinity of the soil to retain water; a is a measure of the largest pore size, whereas n is a measure of the distribution of pore sizes. Finer-textured soils such as clays have lower a due to their small pores and adsorption to clay mineral surfaces. Coarse-textured soils have higher a because of their larger pores. The slope of the SWCC is controlled by n. Higher n corresponds to a shallower slope, and more uniformly distributed pore sizes (Fredlund and Rahardjo, 1993). Coarse textured soils often have larger n than fine-textured soils.

UNSAT-H uses the semi-empirical van Genuchten-Mualem model (van Genuchten 1980) to estimate unsaturated hydraulic conductivity as a function of suction:

$$K(h) = K_{sat} \frac{\left\{1-\left[1-\left(1+(\alpha \cdot h)^{n}\right)^{-1}\right]^{m}\right\}^{2}}{\left[1+(\alpha \cdot h)^{n}\right]^{\frac{m}{2}}}, \quad m = 1-\frac{1}{n}, \qquad (6)$$

where , a, *h*, *n*, and *m* are the same parameters used in Equation 5.

SWCCs used for UNSAT-H modeling and the SWCC laboratory data from the SoilVision database are shown in the Figures attached to this document.

4.3 Vegetation Parameters

4.3.1 Leaf Area Index (LAI)

The cover vegetation information required by UNSAT-H includes Leaf Area Index (LAI), Root Density Function (RDF), information of the growing season duration, the density of plants on the ET cover surface, and the relationship between water potential and plant growth. The LAI is defined as the dimensionless ratio of the leaf area of active transpiring vegetation to the nominal surface area of the land on which the vegetation is growing. According to the HELP model (Schroeder et al., 1994), the LAI for bare ground is zero; the LAI could approach 1.0 for a poor stand of grass, 2.0 for a fair stand of grass, 3.5 for a good stand of grass, and 5.0 for an excellent stand of grass. The LAI for dense stands of trees and shrubbery would also approach 5. In practice, LAI for native semi-arid steppe vegetation, such as expected at the Lisbon Valley site, seldom exceeds 1.0.

The RDF is a function developed based on the relationship between root biomass and root depth or root distribution. Golder developed the LAI and RDF functions based on the Lisbon Valley mine geographic locations and from relevant technical literature. LAI information was developed assuming that the cover will consist of the semi-arid steppe vegetation community dominated by grasses and forbs.

A distribution of LAI at different times of the year is summarized in the following table:

TABLE 4.7

LAI DISTRIBUTION USED FOR UNSAT-H SIMULATIONS

Date	Julian Day	LAI
January 1	1	0.25
April 23	113	0.25
May 15	135	0.70
July 4	185	0.80
August 29	241	0.80
October 8	281	0.30
November 17	321	0.25
December 31	365	0.25

The UNSAT-H code also requires the growing season in terms of starting day and ending day in Julian days. The starting day is the day on which seeds germinate and the ending day is the day on which plants cease transpiring. March 14 (Julian day 73) and November 16 (Julian day 320) were used for the starting and ending days, respectively.

4.3.2 Plant Limiting Moisture

The model requires input of Plant Limiting Moisture, defined as the suction below which plant stomata begin to close, reducing transpiration. A suction of -100 kPa is generally accepted as the Plant Limiting Moisture suction. Wilting point is the suction below which plants can no longer extract moisture from the soil and will permanently wilt. This value is generally considered to equal -1500 kPa, although some species can extract moisture at much lower suctions.

4.3.3 Root Depth Functions

Root density functions were estimated from values reported in Schenk and Jackson (2002) in which generalized root distribution profiles were estimated for various vegetation types. The distribution functions were determined by fitting historical data from studies in similar vegetation types. For purposes of defining the root distribution, the vegetation type is a desert community. Schenk and Jackson (2002) evaluated 10 profiles from desert communities in the western US and developed a non-linear function:

$$\%(D) = \left[1 - (D / D_{50})^{B}\right]^{-1} \qquad (7)$$

where:

$\%(D)$ = the cumulative percent of roots above profile depth D in cm
D = depth in cm
D_{50} = depth at which 50% of the roots are above
B is a dimensionless shape parameter

Schenk and Jackson et al. (2002) determined the following values for semi-arid steppe communities: B = -1.453 and D_{50} = 16 cm.

In UNSAT-H, the root-length density function is a function relationship between normalized (by total weight) root biomass and the depth below surface, which can be expressed as:

$$\rho_{rL} = a \exp(-bz) + c, \qquad (8)$$

where z is the root depth and a, b and c are fitting parameters. One can construct the corresponding cumulative root length density function

$$Y_{rL}(d) = \int_0^d \left[a \exp(-bz) + c\right] \cdot dz, \qquad (9)$$

One can now determine parameters a, b and c by fitting Equation (7) with Y_{rL}. Root density function parameters used for UNSAT-H simulations are summarized in the following table:

TABLE 4.8

ROOT DENSITY FUNCTION PARAMETERS

a	*b*	*c*
2.19 x 10^{-1}	4.69 x 10^{-2}	0.000

5.0 MODELING SCENARIOS AND RESULTS

5.1 Modeling Scenarios

Modeling scenarios were conducted for a 2 ft vegetative cover assuming two sets of climate scenarios: Set 1 – long-term scenarios neglecting snow-melt effects, and Set 2 – short-term scenarios accounting for snow-melt and soil freezing. All long-term UNSAT-H simulations were conducted for the period of record from January 1, 1955 to December 31, 2005 using the SWCCs in Table 4.6. The worst-case scenarios from Set 1 were then analyzed further to determine the influence of snow-melt to infiltration using the climate record from January 1, 1955 to December 31, 1985. The degree-day method was employed to determine snowmelt rates (e.g., Kustas et al., 1994) utilizing the degree-day coefficients, a, of 0.35 $cm/^{o}C$. For conservatism, the surface soils were not allowed to freeze during the winter months and the snow sublimation mechanism was ignored.

5.2 Results

The UNSAT-H results are summarized in the following tables:

TABLE 5.1

AVERAGE ANNUAL INFILTRATION RATES (INCH/YEAR)

Subgrade \ Simulation	Long – Term (no snow-melt)	Short-Term (with snow-melt)
Type 1	0.002	0.066
Type 2	0.000	0.000
Type 3	0.000	0.000

TABLE 5.2

AVERAGE ANNUAL INFILTRATION RATES (% PRECIPITATION)

Subgrade \ Simulation	Long – Term (no snow-melt)	Short-Term (with snow-melt)
Type 1	0.01%	0.43%
Type 2	0.00%	0.00%
Type 3	0.00%	0.00%

6.0 SUMMARY AND CONCLUSIONS

All analyzed ET cover scenarios demonstrate infiltration rates of less than 0.1 inch/year. The short-term UNSAT-H simulation using the lower bound SWCC representing the "coarse soil" limit resulted in limited infiltration of approximately 0.4% of average annual precipitation. Based on the preliminary ET cover evaluations, on-site soils are suitable for vegetative ET cover construction.

The ET cover modeling results indicate the importance of the cover material hydraulic properties. Therefore, a laboratory program characterizing the specific cover material unsaturated hydraulic properties should be conducted to support the final cover design.

7.0 USE OF THIS REPORT

This preliminary design report has been prepared exclusively for the use of Lisbon Valley Mining Company (LVMC) for a preliminary demonstration of the adequacy of the ET cover for closure of the Sentinel East and Sentinel West pits. No third-party engineer or consultant shall be entitled to rely on any of the information, conclusions, or opinions contained in this report without the written approval of Golder and LVMC.

Golder sincerely appreciates the opportunity to support LVMC on this project. Please contact the undersigned with any questions or comments on the information contained in this report.

Respectfully submitted,

GOLDER ASSOCIATES INC.

Gordan Gjerapic, Ph.D., P.E.
Geotechnical Engineer

Brent R. Bronson, P.E.
Principal

GG/BRB:dls

2-14-07

8.0 REFERENCES

1. Fayer, M.J. (2000). "UNSAT-H Version 3.0: Unsaturated Soil Water and Heat Flow Model – Theory, User Manual and Examples." report prepared for U.S. Department of Energy, Pacific Northwest National Laboratory, June.

2. Freeze, R.A. and Cherry, J. A. (1979). "Groundwater," Prentice-Hall, New Jersey.

3. Golder Associates, Inc. (2006), "Lisbon Valley Copper Mine – Construction Quality Assurance Monitoring and Test Results, Stage 2 Heap Leach Pad," report prepared for Lisbon Valley Mining Company, LLC, November.

4. Schroeder, P.R., Dozier, T.S., Zappi, P.A., McEnroe, B.M., Sjostrom, J.W., and Peyton, R.L. 1994. "The Hydrologic Evaluation of Landfill Performance (HELP) Model: Engineering Documentation for Version 3." EPA/600/R-94/168b, U.S. Environmental Protection Agency Office of Research and Development, Washington, DC.

5. J.D. Welsh and Associates, Inc. (1996). "Lisbon Valley Project – Stage 1 Heap Leach Facilities Design Report," report prepared for Summo USA Corporation, Denver, Colorado, October.

6. Kustas, W.P., Rango, A., Uijlenhoet, R. (1994). "A Simple Energy Budget Algorithm for the Snowmelt Runoff Model," Water Resources Research, Vol. 30, No.5, pp. 1515-1527.

7. National Oceanic and Atmospheric Administration (NOAA), National Climate Data Center (NCDC) (1983). "Climate Atlas of the U.S."

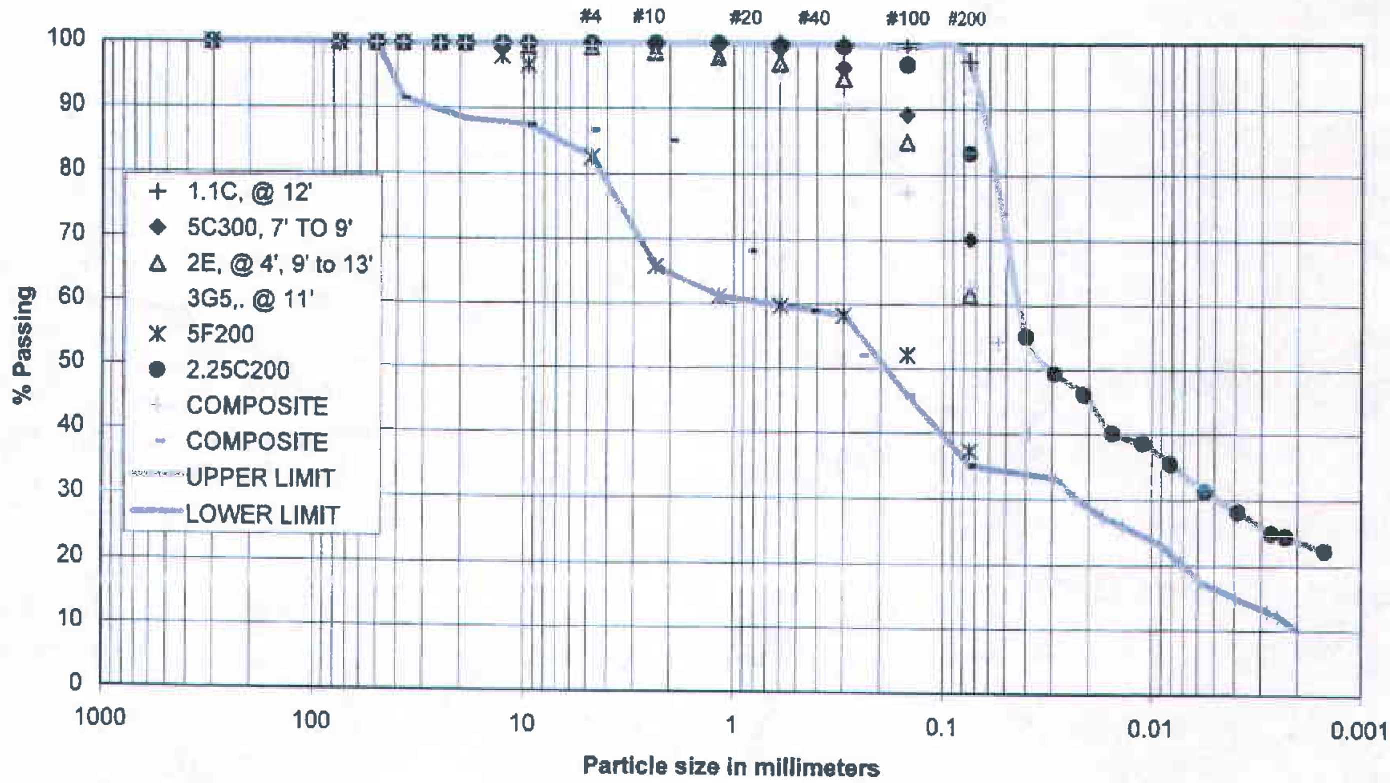
8. Soil Vision Systems Ltd. (2006). "Soil Vision – A Knowledge-Based Database System For Saturated/Unsaturated Soil Properties – User's Manual," Saskatoon, Saskatchewan, Canada.

9. Schenk, H.J., Jackson, R.B., 2002a. The global biogeography of roots. Ecol. Monogr. 72 (3), 311–328.

10. van Genuchten, M., 1980, A Closed-Form Equation for Predicting the Hydraulic Conductivity of Unsaturated Soils, Soil. Sci. Soc. Am. J., 44, pp 892-898.

11. Whetstone Associates, 2007. 2006 Annual Update Of The Lisbon Valley Hydrogeologic System Evaluation. Prepared for Lisbon Valley Mining Company. Document 4124F.070131. January, 2007.

FIGURES



Golder Associates
Denver, Colorado

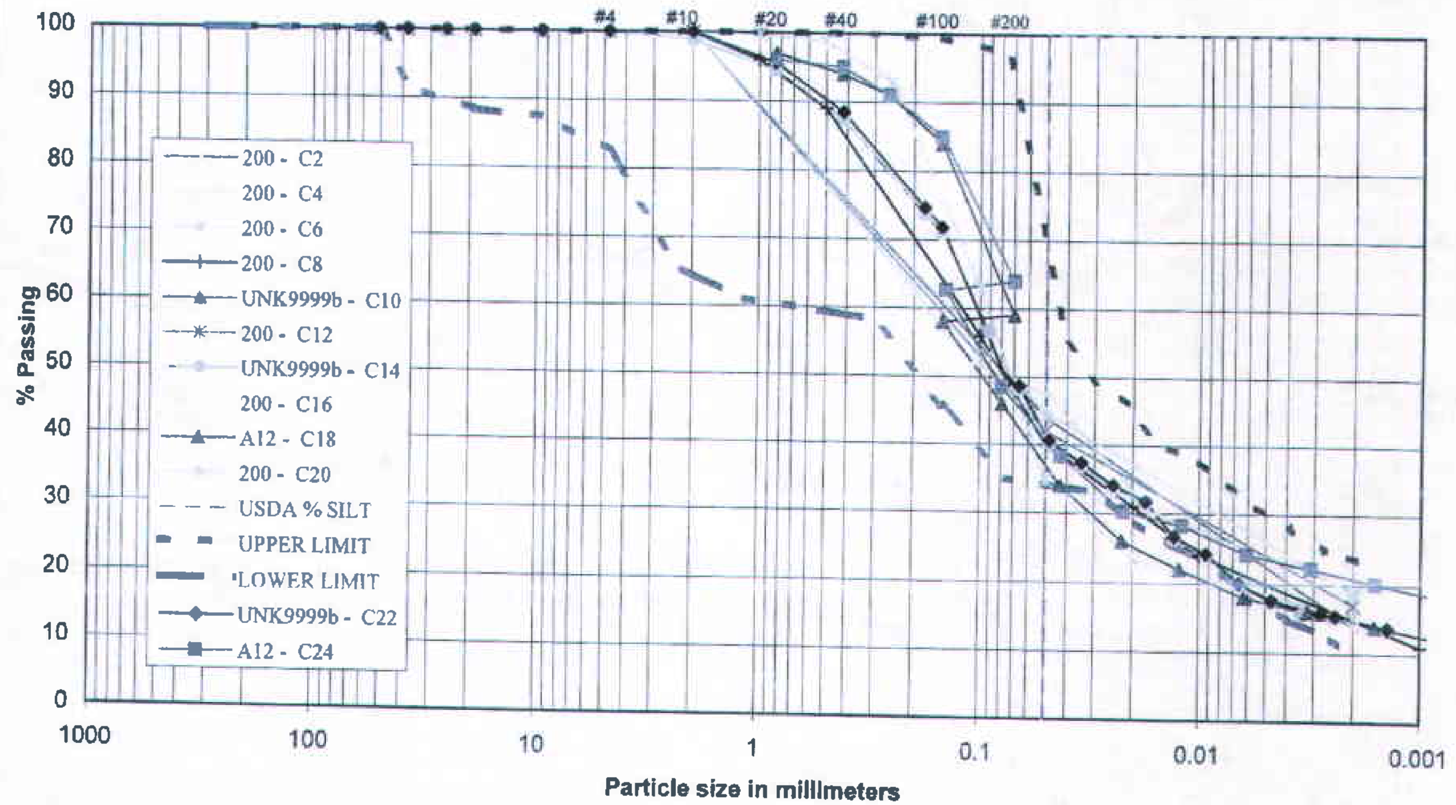
TITLE

Grain Size Distribution - J.D. Welsh, 1996

CLIENT/PROJECT

LISBON VALLEY MINING COMPANY, UTAH

DRAWN	LAQ	DATE	Jan-07	JOB NO.	063-2307
CHECKED	GG	SCALE	AS SHOWN	DWG. NO.	
REVIEWED	BRB	FILE NO.	GrainSize.xls	FIGURE NO.	FIGURE 2

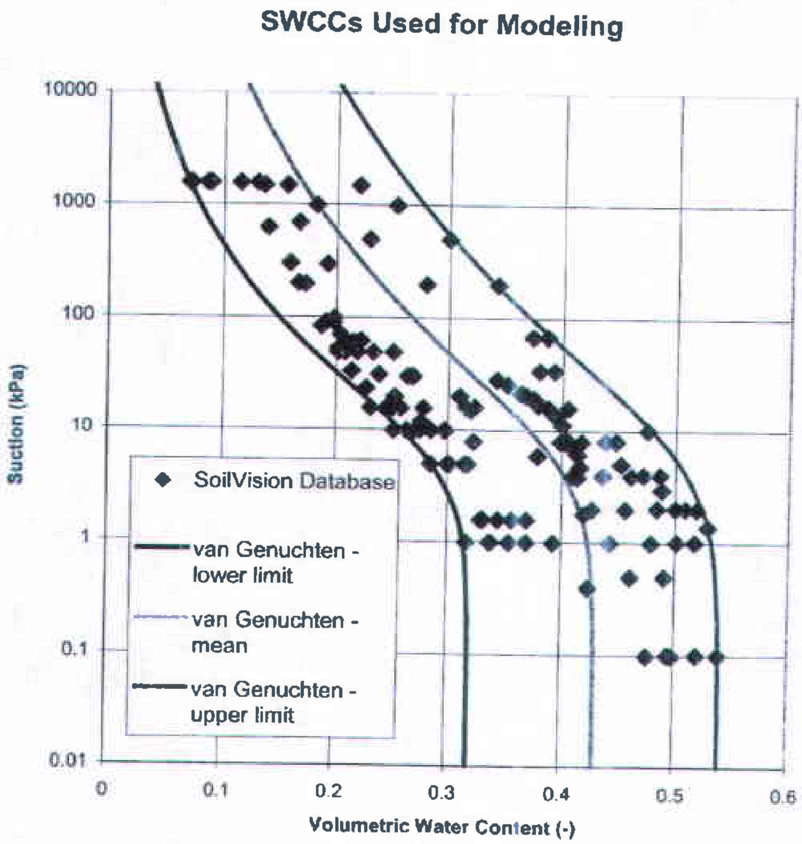


Golder Associates — Denver, Colorado

TITLE: **Grain Size Distribution - SoilVision**

CLIENT/PROJECT: **LISBON VALLEY MINING COMPANY, UTAH**

DRAWN	LAQ	DATE	Jan-07	JOB NO.	063-2307
CHECKED	GG	SCALE	AS SHOWN	DWG NO.	
REVIEWED	BRB	FILE NO.	GrainSize.xls	FIGURE NO.	FIGURE 3



SAMPLE #:

NOTES:

SoilVision Van Genuchten fit			
	lower	mean	upper
alpha=	0.15	0.16	0.17
n=	1.28	1.17	1.13
Sr=	0.00	0.00	0.00
θsat=	0.32	0.43	0.54

Lisbon Valley Project
063-2307

DATE	1/12/2007
CALC	LAQ
REVIEW	GG

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Moab Field Office
82 East Dogwood
Moab, Utah 84532

TAKE PRIDE IN AMERICA

3809
UTU72499
(UTY012)

Certified Mail – Return Receipt Requested
Certified No. 7006 0100 0001 5606 5634

SEP 18 2009

Mr. Lantz Indergard
Lisbon Valley Mining Company
P. O. Box 248
La Sal, Utah 84530

RE: Modification to Plan of Operations – Backfill of Sentinel East Pit, UTU72499

Dear Mr. Indergard:

On April 28, 2009, the BLM received Lisbon Valley Mining Company's (LVMC) Mine Plan Modification proposal. On June 19, 2009, the BLM requested additional groundwater data in order to adequately analyze the modification. Subsequently, LVMC submitted the requested data. Based on our evaluation of the backfill proposal and the supporting data, LVMC's mine plan modification is approved.

The mine plan modification entails backfilling the Sentinel East Pit, which is approximately 600 feet long, 500 feet wide and 140 deep, with approximately 9,000 kilotons of waste rock from mining the Centennial Pit, located southeast of the Sentinel East Pit. The modification includes appropriate measures for mitigating the potential impacts from backfilling.

If you have any questions, please contact Marie McGann at 435-259-2135.

Sincerely,

Assistant Field Manager
Division of Resources

cc: Tom Munson, UDOGM

RECEIVED
DEC 03 2009
DIV. OF OIL, GAS & MINING

Bond Cost Summary - Project Data

Project Parameters

Project Location	Utah	
Region	Remaining Counties	
Distance to Support	38.0	miles
Distance to Dump Site	56.0	miles
Distance to Hazardous Waste Dump	148.0	miles
Special Rate Wage Adjustment		percent
Special Rate Burden Adjustment		percent
Post Closure Monitoring Period		months

Hourly Labor Costs (Wages plus Fringe Benefits)

Supervisors	$31.88	/hour
Loader Operators	$24.46	/hour
Scraper Operators	$25.98	/hour
Bulldozer Operators	$23.32	/hour
Backhoe Operators	$26.68	/hour
Grader Operators	$24.38	/hour
Haul Truck Drivers	$22.11	/hour
Breaker Operators	$25.04	/hour
Tractor Operators	$25.15	/hour
Service Truck Drivers	$17.36	/hour
Construction Workers	$18.93	/hour
Mechanics	$22.51	/hour
Demolition Laborers	$15.46	/hour
Site Work Laborers	$14.78	/hour

Supply Costs

Diesel Fuel	$3.446	/gallon
Gasoline	$2.887	/gallon
Electric Power	$0.050	/kWh
Off-site Mainenance Labor	$25.08	/hour

Bond Cost Summary - Earthwork Costs

Excavate/Load/Haul/Dump		
Waste Dump B - topsoil		
Excavator	Wheel Loader # 1	
Hauler	Truck # 1	
Bank Density	2,857	pounds/cubic yard
Swell Factor	15	percent
Excavated Density	2,484	pounds/cubic yard
Loader Bucket Volume Capacity	9.0	cubic yards
Loader Bucket Weight Capacity	30.5	tons
Loader Availability	80.4	percent
Loader Rolling Resistance	3.0	percent
Loader Bucket Fill Factor	95.0	percent
Truck Bed Weight Capacity	40.0	tons
Truck Bed Volume Capacity	28.6	cubic yards
Truck Availability	84.2	percent
Truck Rolling Resistance	3.0	percent
Truck Bed Fill Factor	95.0	percent
Transport Distance # 1	2,000	feet
Transport Gradient # 0	3.0	percent
Volume	151,821	cubic yards
Loader Cycle Time	0.25	minutes
Truck Cycle Time	3.96	minutes
Job Cost	$68,192	

Lisbon Valley Copper Mine

Bond Cost Summary - Earthwork Costs

Waste Dump C - topsoil		
Excavator	Wheel Loader # 1	
Hauler	Truck # 1	
Bank Density	2,857	pounds/cubic yard
Swell Factor	15	percent
Excavated Density	2,484	pounds/cubic yard
Loader Bucket Volume Capacity	9.0	cubic yards
Loader Bucket Weight Capacity	30.5	tons
Loader Availability	80.4	percent
Loader Rolling Resistance	3.0	percent
Loader Bucket Fill Factor	95.0	percent
Truck Bed Weight Capacity	40.0	tons
Truck Bed Volume Capacity	28.6	cubic yards
Truck Availability	84.2	percent
Truck Rolling Resistance	3.0	percent
Truck Bed Fill Factor	95.0	percent
Transport Distance # 1	2,000	feet
Transport Gradient # 0	3.0	percent
Volume	458,963	cubic yards
Loader Cycle Time	0.25	minutes
Truck Cycle Time	3.96	minutes
Job Cost	$206,065	

Lisbon Valley Copper Mine

Bond Cost Summary - Earthwork Costs

All Ponds - topsoil		
Excavator	Wheel Loader # 1	
Hauler	Truck # 1	
Bank Density	2,857	pounds/cubic yard
Swell Factor	15	percent
Excavated Density	2,484	pounds/cubic yard
Loader Bucket Volume Capacity	9.0	cubic yards
Loader Bucket Weight Capacity	30.5	tons
Loader Availability	80.4	percent
Loader Rolling Resistance	3.0	percent
Loader Bucket Fill Factor	95.0	percent
Truck Bed Weight Capacity	40.0	tons
Truck Bed Volume Capacity	28.6	cubic yards
Truck Availability	84.2	percent
Truck Rolling Resistance	3.0	percent
Truck Bed Fill Factor	95.0	percent
Transport Distance # 1	1,000	feet
Transport Gradient # 0	1.0	percent
Volume	22,786	cubic yards
Loader Cycle Time	0.25	minutes
Truck Cycle Time	2.65	minutes
Job Cost	$7,866	

Bond Cost Summary - Earthwork Costs

Plant and Crusher Areas

Excavator	Wheel Loader # 1	
Hauler	Truck # 1	
Bank Density	2,857	pounds/cubic yard
Swell Factor	15	percent
Excavated Density	2,484	pounds/cubic yard
Loader Bucket Volume Capacity	9.0	cubic yards
Loader Bucket Weight Capacity	30.5	tons
Loader Availability	80.4	percent
Loader Rolling Resistance	3.0	percent
Loader Bucket Fill Factor	95.0	percent
Truck Bed Weight Capacity	40.0	tons
Truck Bed Volume Capacity	28.6	cubic yards
Truck Availability	84.2	percent
Truck Rolling Resistance	3.0	percent
Truck Bed Fill Factor	95.0	percent
Transport Distance # 1	1,000	feet
Transport Gradient # 0	1.0	percent
Volume	41,080	cubic yards
Loader Cycle Time	0.25	minutes
Truck Cycle Time	2.65	minutes
Job Cost	$14,148	

Bond Cost Summary - Earthwork Costs

Haul Roads-topsoil		
Excavator	Wheel Loader # 1	
Hauler	Truck # 1	
Bank Density	2,857	pounds/cubic yard
Swell Factor	15	percent
Excavated Density	2,484	pounds/cubic yard
Loader Bucket Volume Capacity	9.0	cubic yards
Loader Bucket Weight Capacity	30.5	tons
Loader Availability	80.4	percent
Loader Rolling Resistance	3.0	percent
Loader Bucket Fill Factor	95.0	percent
Truck Bed Weight Capacity	40.0	tons
Truck Bed Volume Capacity	28.6	cubic yards
Truck Availability	84.2	percent
Truck Rolling Resistance	3.0	percent
Truck Bed Fill Factor	95.0	percent
Transport Distance # 1	1,000	feet
Transport Gradient # 0	1.0	percent
Volume	45,007	cubic yards
Loader Cycle Time	0.25	minutes
Truck Cycle Time	2.65	minutes
Job Cost	$15,497	

Bond Cost Summary - Earthwork Costs

Waterline-Topsoil		
Excavator	Wheel Loader # 1	
Hauler	Truck # 1	
Bank Density	2,857	pounds/cubic yard
Swell Factor	15	percent
Excavated Density	2,484	pounds/cubic yard
Loader Bucket Volume Capacity	9.0	cubic yards
Loader Bucket Weight Capacity	30.5	tons
Loader Availability	80.4	percent
Loader Rolling Resistance	3.0	percent
Loader Bucket Fill Factor	95.0	percent
Truck Bed Weight Capacity	40.0	tons
Truck Bed Volume Capacity	28.6	cubic yards
Truck Availability	84.2	percent
Truck Rolling Resistance	3.0	percent
Truck Bed Fill Factor	95.0	percent
Transport Distance # 1	1,000	feet
Transport Gradient # 0	1.0	percent
Volume	7,582	cubic yards
Loader Cycle Time	0.25	minutes
Truck Cycle Time	2.65	minutes
Job Cost	$2,644	

Bond Cost Summary - Earthwork Costs

Heap Leach -topsoil		
Excavator	Wheel Loader # 1	
Hauler	Truck # 1	
Bank Density	2,857	pounds/cubic yard
Swell Factor	15	percent
Excavated Density	2,484	pounds/cubic yard
Loader Bucket Volume Capacity	9.0	cubic yards
Loader Bucket Weight Capacity	30.5	tons
Loader Availability	80.4	percent
Loader Rolling Resistance	3.0	percent
Loader Bucket Fill Factor	95.0	percent
Truck Bed Weight Capacity	40.0	tons
Truck Bed Volume Capacity	28.6	cubic yards
Truck Availability	84.2	percent
Truck Rolling Resistance	3.0	percent
Truck Bed Fill Factor	95.0	percent
Transport Distance # 1	1,000	feet
Transport Gradient # 0	1.0	percent
Volume	287,049	cubic yards
Loader Cycle Time	0.25	minutes
Truck Cycle Time	2.65	minutes
Job Cost	$98,617	

Bond Cost Summary - Site Work Costs

Fence Construction		
Sentinel Pit 1		
Construction Method	Barbed Wire	
Height	4.0	feet
Length	5,620	feet
Number of Corners	6	corners
Number of Gates		gates
Job Cost	$14,590	
Sentinel Pit 2		
Construction Method	Barbed Wire	
Height	4.0	feet
Length	2,140	feet
Number of Corners	4	corners
Number of Gates		gates
Job Cost	$5,588	
Centennial Pit		
Construction Method	Barbed Wire	
Height	4.0	feet
Length	8,980	feet
Number of Corners	10	corners
Number of Gates		gates
Job Cost	$23,272	
GTO Pit		
Construction Method	Barbed Wire	
Height	4.0	feet
Length	7,410	feet
Number of Corners	10	corners
Number of Gates		gates
Job Cost	$19,237	
Seed		
Dump B		
Seed Variety	Crested Wheatgrass	
Application Method	Mechanical	
Area	94.00	acres
Application Rate	10.00	pounds/acre
Job Cost	$28,245	
Dump C		
Seed Variety	Crested Wheatgrass	
Application Method	Mechanical	
Area	120.00	acres
Application Rate	10.00	pounds/acre
Job Cost	$36,057	

Bond Cost Summary - Site Work Costs

Heap Leach		
Seed Variety	Crested Wheatgrass	
Application Method	Mechanical	
Area	178.00	acres
Application Rate	10.00	pounds/acre
Job Cost	$53,485	
Four Pond Areas		
Seed Variety	Crested Wheatgrass	
Application Method	Mechanical	
Area	14.00	acres
Application Rate	10.00	pounds/acre
Job Cost	$4,207	
Plant and Crusher Area		
Seed Variety	Crested Wheatgrass	
Application Method	Mechanical	
Area	26.00	acres
Application Rate	10.00	pounds/acre
Job Cost	$7,812	
Haul Roads		
Seed Variety	Crested Wheatgrass	
Application Method	Mechanical	
Area	27.20	acres
Application Rate	10.00	pounds/acre
Job Cost	$8,173	
Water Line		
Seed Variety	Crested Wheatgrass	
Application Method	Mechanical	
Area	5.00	acres
Application Rate	10.00	pounds/acre
Job Cost	$1,502	
Building Demolition		
Admin Building		
Building Construction Materials	Wood Frame/Steel Siding	
Average Building Height	14	feet
Average Building Length	100	feet
Average Building Width	56	feet
Haul Distance	148.0	miles
Job Cost	$53,916	

Lisbon Valley Copper Mine

Bond Cost Summary - Site Work Costs

SX1	
Building Construction Materials	Steel Frame/Steel Siding
Average Building Height	32 feet
Average Building Length	235 feet
Average Building Width	60 feet
Haul Distance	148.0 miles
Job Cost	$306,706
Truck Shop	
Building Construction Materials	Steel Frame/Steel Siding
Average Building Height	34 feet
Average Building Length	167 feet
Average Building Width	52 feet
Haul Distance	148.0 miles
Job Cost	$201,231
Laboratory Building	
Building Construction Materials	Steel Frame/Steel Siding
Average Building Height	14 feet
Average Building Length	40 feet
Average Building Width	40 feet
Haul Distance	148.0 miles
Job Cost	$16,040
Primary Crusher	
Building Construction Materials	Steel Frame/Steel Siding
Average Building Height	30 feet
Average Building Length	30 feet
Average Building Width	30 feet
Haul Distance	148.0 miles
Job Cost	$6,023
Secondary Tank	
Building Construction Materials	Steel Frame/Steel Siding
Average Building Height	30 feet
Average Building Length	30 feet
Average Building Width	30 feet
Haul Distance	148.0 miles
Job Cost	$6,023
Secondary Crusher	
Building Construction Materials	Steel Frame/Steel Siding
Average Building Height	30 feet
Average Building Length	30 feet
Average Building Width	30 feet
Haul Distance	56.0 miles
Job Cost	$9,728

Bond Cost Summary - Site Work Costs

Pavement Demolition		
Admin Building Floor		
Construction	Concrete	
Reinforcement	Rebar	
Pavement Thickness	6.0	inches
Paved Surface Area	5,600	square feet
Haul Distance	0.0	miles
Job Cost	$9,823	
Laboratory Building Floor		
Construction	Concrete	
Reinforcement	Rebar	
Pavement Thickness	6.0	inches
Paved Surface Area	1,600	square feet
Haul Distance	0.0	miles
Job Cost	$2,807	
Truck Shop Floor		
Construction	Concrete	
Reinforcement	Rebar	
Pavement Thickness	6.0	inches
Paved Surface Area	8,684	square feet
Haul Distance	0.0	miles
Job Cost	$15,232	
SX1 Floor		
Construction	Concrete	
Reinforcement	Rebar	
Pavement Thickness	6.0	inches
Paved Surface Area	14,100	square feet
Haul Distance	0.0	miles
Job Cost	$24,733	
Primary Crusher		
Construction	Concrete	
Reinforcement	Rebar	
Pavement Thickness	0.6	inches
Paved Surface Area	2,000	square feet
Haul Distance	0.0	miles
Job Cost	$391	
Secondary Crusher		
Construction	Concrete	
Reinforcement	Rebar	
Pavement Thickness	0.6	inches
Paved Surface Area	2,000	square feet
Haul Distance	0.0	miles
Job Cost	$391	

Bond Cost Summary - Site Work Costs

Scarify		
Dump B - scarify top		
Surface Area	41.00	acres
Average Side Slope	0.0	percent
Number of Passes	4	passes
Implement Width	12.0	feet
Average Machine Speed	4.1	miles per hour
Job Cost	$4,461	
Dump C - scarify top		
Surface Area	71.12	acres
Average Side Slope	0.0	percent
Number of Passes	4	passes
Implement Width	12.0	feet
Average Machine Speed	4.1	miles per hour
Job Cost	$7,738	
Haul Roads		
Surface Area	40.00	acres
Average Side Slope	0.0	percent
Number of Passes	4	passes
Implement Width	12.0	feet
Average Machine Speed	4.1	miles per hour
Job Cost	$4,352	
Drill Hole Closure		
PW-1		
Hole Diameter	Hand Shovel	inches
Number of Holes	10	holes
Plug Depth	1	feet
Cement Content	358	percent
Job Cost	$1,289	
PW-2		
Hole Diameter	Hand Shovel	inches
Number of Holes	6	holes
Plug Depth	1	feet
Cement Content	341	percent
Job Cost	$472	
PW3 through PW8 and SLV-3		
Hole Diameter	Hand Shovel	inches
Number of Holes	8	holes
Plug Depth	7	feet
Cement Content	5,285	percent
Job Cost	$82,631	

Bond Cost Summary - Site Work Costs

All Monitoring Wells		
Hole Diameter	Hand Shovel	inches
Number of Holes	2	holes
Plug Depth	19	feet
Cement Content	10,970	percent
Job Cost	$29,102	
Leach Pad Closure		
Heap Leach Pad as of 7/29/09 - 70%		
Closure Method	Natural Cap	
Lining	Do Not Remove	
Surface Area	7,750,317	square feet
Heap Thickness	30	feet
Distance to Source	0	feet
Job Cost	$1,909,145	
Pond Closure		
Raffinate Pond		
Construction	Excavation	
Lining	Synthetic	
Pond Surface Area	160,000	square feet
Pond Depth	50	feet
Distance to Fill Source	2,000	feet
Job Cost	$127,255	
PLS Pond		
Construction	Excavation	
Lining	Synthetic	
Pond Surface Area	160,000	square feet
Pond Depth	50	feet
Distance to Fill Source	2,000	feet
Job Cost	$127,255	
ILS Pond		
Construction	Excavation	
Lining	Synthetic	
Pond Surface Area	160,000	square feet
Pond Depth	50	feet
Distance to Fill Source	2,000	feet
Job Cost	$127,255	
Storm Water Pond		
Construction	Excavation	
Lining	Synthetic	
Pond Surface Area	160,000	square feet
Pond Depth	50	feet
Distance to Fill Source	2,000	feet
Job Cost	$127,255	

Bond Cost Summary - Site Work Costs

Pumping		
Lime and Rinse Heap Leach		
Flow Rate	40	gallons per minute
Relative Inlet Elevation	0	feet
Relative Outlet Elevation	100	feet
Pumping Distance	2,000	feet
Duration	540	days
Job Cost	$337,507	
Periodic Sampling		
Groundwater Sampling		
Frequency	Semi-Annually	
Samples per Period	22	
Preparation	Filtration	
Category	Safe Drinking Water Act	
Constituents	Metals	
Job Cost	$64,573	

Lisbon Valley Copper Mine

Bond Cost Summary - Project Fleet

Equipment Requirements

Hydraulic Backhoe	2.40	cubic yard
Bulldozer	205	horsepower
Flatbed Truck	15,000	pound gvw
Flatbed Truck	20,000	pound gvw
Rear-Dump Hauler	40	ton
Front-End Loader	9.0	cubic yard
Crawler Tractor	75	horsepower
Crawler Tractor	185	horsepower
Pump	5.0	horsepower
Hydraulic Hammer	4,700	pound
Auger	8.0	inch
Concrete Pump	24,700	cubic yard/hour

Bond Cost Summary - Project Crew

Crew Requirements		
Project Foremen	3,588.2	hours
Loader Operators	3,075.4	hours
Bulldozer Operators	3,050.0	hours
Backhoe Operators	176.7	hours
Haul Truck Drivers	4,244.4	hours
Samplers	2.2	hours
Seeder Operators	2,181.7	hours
Tractor Operators	149.0	hours
Mechanics	4.0	hours
Laborers	6,059.4	hours
Auger Operators	151.5	hours

Bond Cost Summary - Mobilization Costs

Equipment Mobilization Costs	
Hydraulic Backhoe	$278
Bulldozer	$241
Rear-Dump Hauler	$278
Front-End Loader	$376
Total Mobilization Cost	$1,173

Bond Cost Summary - Job Cost Summary

Project Job Costs	
Waste Dump B - topsoil	$68,192
Waste Dump C - topsoil	$206,065
All Ponds - topsoil	$7,866
Plant and Crusher Areas	$14,148
Haul Roads-topsoil	$15,497
Waterline-Topsoil	$2,644
Heap Leach -topsoil	$98,617
Sentinel Pit 1	$14,590
Sentinel Pit 2	$5,588
Centennial Pit	$23,272
GTO Pit	$19,237
Dump B	$28,245
Dump C	$36,057
Heap Leach	$53,485
Four Pond Areas	$4,207
Plant and Crusher Area	$7,812
Haul Roads	$8,173
Water Line	$1,502
Admin Building	$53,916
SX1	$306,706
Truck Shop	$201,231
Laboratory Building	$16,040
Primary Crusher	$6,023
Secondary Tank	$6,023
Secondary Crusher	$9,728
Admin Building Floor	$9,823
Laboratory Building Floor	$2,807
Truck Shop Floor	$15,232
SX1 Floor	$24,733
Primary Crusher	$391
Secondary Crusher	$391
Dump B - scarify top	$4,461
Dump C - scarify top	$7,738
Haul Roads	$4,352
PW-1	$1,289
PW-2	$472
PW3 through PW8 and SLV-3	$82,631
All Monitoring Wells	$29,102
Heap Leach Pad as of 7/29/09 - 70%	$1,909,145
Raffinate Pond	$127,255
PLS Pond	$127,255
ILS Pond	$127,255
Storm Water Pond	$127,255
Lime and Rinse Heap Leach	$337,507
Groundwater Sampling	$64,573
Equipment Mobilization	$1,173
Total	$4,219,708

Bond Cost Summary - Project Overhead

Administative and Overhead Charges		
Project Operation and Maintenance Costs		$4,219,708
Project Contingency	7.00 percent	$295,380
Contractor's Profit	10.00 percent	$421,971
Liability Insurance	1.50 percent	$7,409
Bond Premium	3.00 percent	$126,591
Engineering and Design	6.00 percent	$253,182
Agency Indirect Costs	14.00 percent	$590,759
Agency Contract Management	21.00 percent	$124,059
Total Project Overhead Cost		$1,819,352

Reclamation Bond For Operation as of August 18, 2009
Reclamation Bond Calculation

Bond Cost Summary	
Bond Cost Estimate	
Earth Moving	$413,029
Site Work	$79,237
Planting and Seeding	$139,482
Closures	$2,869,168
Demolition	$653,045
Disposal	$0
Monitoring	$64,573
Mobilization	$1,173
Administration	$1,819,352
Required Bond Value	$6,039,060

Evaluator: Project Evaluator
Tuesday, August 18, 2009

Bureau of Land Management
Sherpa for Reclamation Bonds - Version 2.07